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**CHILDREN WHO CANNOT READ**

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# CHILDREN WHO CANNOT READ

THE ANALYSIS OF READING DISABILITIES  
AND THE USE OF DIAGNOSTIC TESTS  
IN THE INSTRUCTION OF  
RETARDED READERS

MARION MONROE

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and Behavior Research Fund*



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## FOREWORD

Children with reading difficulties are under a severe handicap in modern society. They are debarred from the world of imagination, knowledge, and power opened up by newspapers, magazines, and books. More than this, they are highly sensitive to this deficiency that marks them off from their fellows. The emotional blocking thus occasioned tends also to prevent their achievement in other fields.

To the task of understanding the reading difficulties of these sensitive children Dr. Monroe brought a sympathetic attitude, a discerning and painstaking analysis of each case, and a patient perseverance in treating the problem. This study, therefore, embodies in unusual degree the combination of behavior research of high scientific standards with successful therapy.

The materials in this book are organized and presented not only for the specialist in this field but also in a way to be helpful to the teacher and the parent baffled by the problems of the child with reading difficulties. It is not often that one may present a product of scientific research which is also of immediate help in removing a handicap common to thousands of school children.

ERNEST W. BURGESS  
*Director, Behavior Research Fund*



## PREFACE

This study would not be complete without an attempt to express my gratitude to the many persons and institutions who have had close contact and interest in the research.

The study was made possible by the Behavior Research Fund and the Institute for Juvenile Research. To Dr. Ernest Burgess, director of the Behavior Research Fund; to Dr. Herman Adler, former director of the Behavior Research Fund and the Institute for Juvenile Research; to Dr. Paul Schroeder, present director of the Institute; and to Mr. John C. Weigel, administrator of the Institute and of the Behavior Research Fund, I wish to express gratitude for administrative aid and valuable suggestions which have facilitated the research.

To the psychiatrists, psychologists, psychiatric social workers, and other members of the staff of the Institute for Juvenile Research I am indebted for co-operation and many helpful suggestions. My colleagues will recognize in many of the cases reported in this study the evidence of their contributions. To the psychologists, under the direction of Dr. Andrew Brown, I am indebted for the assistance in giving the battery of the diagnostic reading tests and for selection of cases. My assistants, Miss Helen Gibbons and Miss Laura Gundlach, should be especially mentioned for the large number of tests which they gave and followed through with remedial treatment, conferences with teachers, and re-examinations. They also made many helpful suggestions on the remedial devices. I am indebted to Dr. Luton Ackerson for constructive suggestions on statistical procedures.

Many institutions and persons other than the Institute for Juvenile Research and its staff have also contributed to the study. Miss Azile Reynolds, principal of Armstrong School, and Miss Mary Willard, principal of Kenwood School, Chicago, were most co-operative in giving permission to test the children of their schools who formed the group of controls. Dr. Grace E. Munson and the members of the Bureau of Child Study of the Chicago

Public Schools have referred many interesting cases for study and have co-operated in the remedial work. Mr. Edward H. Stullken, principal, and Miss Charlotte Lowe, psychologist, of the Monte-fiore Special School, Mr. Carleton Washburne, superintendent, and the members of the Bureau of Educational Counsel of the Winnetka Public Schools, and Mr. W. J. Hamilton, superintendent, and Miss Ethel Burris of the Department of Methods and Research of the Oak Park Public Schools, were most co-operative in the experiments in remedial instruction. I wish to thank also the large number of superintendents, principals, and teachers from many communities who referred cases and gave generously of their time in remedial instruction. Miss Ruth L. McMillen and Miss Leota Blow should receive mention for the large number of cases that they trained. The research could not have been accomplished without the combined efforts of many persons. Our mutual goal was the ultimate happiness of the individual children whom we studied co-operatively from our various points of interest and training.

The present study is in many respects an outgrowth of a previous one made at the University of Iowa and reported in the "Genetic Psychology Monographs" (Clark University Press), Vol. IV, Nos. 4 and 5, October, November, 1928. A number of problems that are attacked experimentally here have their origins in the former investigation. Dr. Samuel T. Orton first called my attention to the unusual facility which poor readers sometimes have in mirror-reading and mirror-writing, to their reversal errors and problems suggested by such observations. Several of the tests and techniques developed in the former study have been elaborated and perfected in the present study. Reference to the previous investigation in comparison with the present one will show the extensions, modifications, and new points of attack that have taken place during three additional years which I have spent in the study of reading disabilities.

I wish to thank Mrs. Lilian Davis, of the Institute for Juvenile Research, and Dr. W. S. Gray, of the University of Chicago, for reading the manuscript and making helpful suggestions.

MARION MONROE

## CONTENTS

I. THE QUANTITATIVE MEASUREMENT OF READING DEFECTS . . . . .	1
II. TYPICAL INDIVIDUAL CHARTS SHOWING DISCREPANCIES BE- TWEEN READING AND OTHER ACCOMPLISHMENTS . . . . .	18
III. THE QUALITATIVE MEASUREMENT OF READING DEFECTS . . . . .	34
IV. TYPICAL INDIVIDUAL PROFILES OF ERRORS . . . . .	59
V. CAUSATIVE FACTORS IN READING DEFECTS . . . . .	79
VI. REMEDIAL INSTRUCTION IN READING: METHODS . . . . .	111
VII. REMEDIAL INSTRUCTION IN READING: RESULTS . . . . .	137
VIII. TYPICAL CASE STUDIES . . . . .	159
BIBLIOGRAPHY . . . . .	178
APPENDIX. DIRECTIONS FOR GIVING TESTS . . . . .	183
INDEX . . . . .	203



## LIST OF TABLES

I. DISTRIBUTIONS OF CHRONOLOGICAL AGES OF CONTROL CHILDREN AND READING-DEFECT CASES . . . . .	4
II. DISTRIBUTIONS OF MENTAL AGES OF CONTROL CHILDREN AND READING-DEFECT CASES . . . . .	4
III. DISTRIBUTIONS OF INTELLIGENCE QUOTIENTS OF CONTROL CHILDREN AND READING-DEFECT CASES . . . . .	5
IV. DISCREPANCIES BETWEEN CHRONOLOGICAL AGE AND READING ACHIEVEMENT . . . . .	9
V. DISCREPANCIES BETWEEN MENTAL AGE AND READING ACHIEVEMENT . . . . .	11
VI. DISCREPANCIES BETWEEN ARITHMETIC AND READING ACHIEVEMENT . . . . .	13
VII. STANDARD DEVIATIONS AND PERCENTILE RANKS OF READING INDICES . . . . .	16
VIII. CONVERSION OF RAW ERRORS OF THE PROFILE OF ERRORS TO PROPORTIONATE SCORES FOR 500 WORDS READ . . . . .	39
IX. VOWELS: <i>z</i> -SCORES . . . . .	44
X. CONSONANTS: <i>z</i> -SCORES . . . . .	45
XI. REVERSALS: <i>z</i> -SCORES . . . . .	46
XII. ADDITION OF SOUNDS: <i>z</i> -SCORES . . . . .	47
XIII. OMISSION OF SOUNDS: <i>z</i> -SCORES . . . . .	48
XIV. SUBSTITUTION: <i>z</i> -SCORES . . . . .	49
XV. REPETITION: <i>z</i> -SCORES . . . . .	50
XVI. ADDITION OF WORDS: <i>z</i> -SCORES . . . . .	51
XVII. OMISSION OF WORDS: <i>z</i> -SCORES . . . . .	52
XVIII. REFUSALS AND WORDS AIDED: <i>z</i> -SCORES . . . . .	53
XIX. TOTAL ERRORS: <i>z</i> -SCORES . . . . .	54
XX. COMPARISON OF <i>z</i> -SCORES OF CONTROLS AND READING-DEFECT CASES IN THE PROFILE OF ERRORS . . . . .	58
XXI. HAND-AND-EYE PREFERENCES OF CONTROLS AND READING-DEFECT CASES . . . . .	85
XXII. HAND-AND-EYE RELATIONSHIPS OF CONTROLS AND READING-DEFECT CASES . . . . .	85
XXIII. MIRROR TESTS . . . . .	88

32. CASE 30, MISS C. . . . .	74
33. CASE 31, RICHARD . . . . .	75
34. CASE 32, CARL . . . . .	77
35. DISTRIBUTIONS OF READING INDICES BEFORE AND AFTER REMEDIAL INSTRUCTION . . . . .	149
36. RATES OF PROGRESS IN READING FOR MONTH'S TREATMENT . . . . .	150
37. RATES OF PROGRESS IN READING FOR HOUR'S TREATMENT . . . . .	150
38. CASE 33, BETTY . . . . .	159
39. CASE 34, DICK . . . . .	161
40. CASE 35, MARY . . . . .	163
41. CASE 36, CLIFFORD . . . . .	165
42. CASE 37, CHARLOTTE . . . . .	167
43. CASE 38, HUGH . . . . .	170
44. CASE 39, LOUIS . . . . .	172
45. CASE 40, GORDON . . . . .	174
46. TEST WORDS USED IN MIRROR-WRITING . . . . .	198
47. FIGURES USED IN VISUAL-AUDITORY LEARNING TEST . . . . .	200

## CHAPTER I

### THE QUANTITATIVE MEASUREMENT OF READING DEFECTS

The fact that a child may fail to learn to read and yet be of adequate intelligence is receiving increasing attention from educators, psychologists, and psychiatrists. Until recent years teachers have assumed that any child who attended school regularly could learn to read, and that if he did not he must be either lazy or stupid. With the advent of intelligence and achievement tests, however, psychologists have studied the relationships which exist between measures of capacities and achievements. They have observed that the relationships are in some instances very close, and in others merely a trend too slight to justify the prediction of one trait from another in the case of any individual. Even between closely related abilities, such as reading and intelligence, there is a range of disparity in which we find such variations as the bright child who cannot read although he can comprehend material read to him, and the defective child who reads fluently although he is unable to deal intelligently with the material read.

The atypical children who do not learn to read so well as would be expected from their other intellectual abilities present serious educational problems. In order to differentiate them from the general defectives in whom the entire pattern of intellectual traits is more or less uniformly retarded, they may be regarded as having a special defect. Such a defect, if persistent, usually prevents the child from making progress at school and ultimately blocks the possibility of his preparation for an economic position in keeping with his other capacities.

#### SOURCE OF CASES

The study of a large number of children who present reading difficulties was made possible by the Behavior Research Fund, and by the Institute for Juvenile Research whose clinical service gave access to many children having various kinds of problems.

Four hundred and fifteen children who have special reading defects that vary from mild retardation in reading to extreme disabilities have been studied and compared with a control group of one hundred and one school children in an average American school population.

The reading-defect cases were divided into three groups on the basis of the method of their being referred. The first group was obtained from the routine examinations of the clinic of the Institute for Juvenile Research. The children were brought there for many problems as well as for poor reading. The fact that certain children were unable to read, or were very poor readers, was noticed during the course of the routine clinical examination, and the study of the reading disability was made a part of the clinical program. This group of children, in which there is a variety of behavior and environmental problems, will be called the "clinic reading cases." The agencies referring the children consisted of parents, teachers, social agencies, charitable organizations, the juvenile court, etc.

The children of the second group were referred by parents, teachers, and school psychologists only for a study of their reading difficulties. Some of them were found to present other problems as well, but the reading defect was the primary reason for referring and the cases were relatively free from other complicating social and environmental problems. They would not have been brought to the clinic had there not been a special study of reading disability in progress from which their teachers and parents desired to receive help. This group of children will be called the "special reading cases."

The third group of children was referred for a study of their reading by the psychologists and teachers of special schools and rooms for borderline and mentally defective children. They were, for this reason, limited in their intelligence range. While some were found to be of average intelligence in spite of their school placement, the group as a whole was inferior in intellectual capacity. Many of these children presented the usual complication of problems of the defective child in school adjustment, and many of them were behavior problems as well. They were referred,

however, for further study of their reading in order that the school might be able to apply satisfactory remedial methods. This group of children will be called "defective reading cases."

There was some overlapping in the sort of cases found in the three groups. Some of the clinic cases were defective in intelligence as were the subnormal-room group; some of the special cases presented a variety of problems as did the clinic cases, but, on the whole, the differentiations of the groups are fairly clear cut.

The one hundred and one school children will be designated as "controls." Although a few of them were found to have reading and behavior problems, we assume that the frequency of the problems is that found in any group of children in schools of average to good American population.

In addition to these four groups of children, examinations were made of a number of miscellaneous cases of special interest, such as defective children who read exceptionally well, adult reading-defect cases who were parents of children having reading difficulties, university students who read poorly, and a case of loss of reading ability in an adult after a brain disease. Data from these cases were too few to be treated statistically, but will be referred to in the illustrative material.

#### DISTRIBUTIONS OF CHRONOLOGICAL AGES, MENTAL AGES, AND INTELLIGENCE QUOTIENTS

The distributions of chronological and mental ages and intelligence quotients of the four main experimental groups of children are given in Tables I, II, and III.

The mean chronological ages of the reading-defect cases were several years in advance of the controls. This discrepancy is one which is due to the following cause. We wished to secure as a control a group of children who were in the beginning stages of learning to read in order to compare the usual learning process with that of the reading-defect cases. As our reading-defect cases were extremely retarded in reading, it was necessary to secure a young control group if we were to have somewhat similar stages of learning for comparison.

## CHILDREN WHO CANNOT READ

The mental ages of the children were obtained from the Stanford revision of the Binet-Simon tests except in a few cases in

TABLE I  
DISTRIBUTIONS OF CHRONOLOGICAL AGES OF CONTROL  
CHILDREN AND READING-DEFECT CASES

Years and Months of Chronological Age	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
6-0 to 6-II.....	1	7	.....	.....
7-0 to 7-II.....	34	22	14	.....
8-0 to 8-II.....	48	28	22	2
9-0 to 9-II.....	14	36	23	5
10-0 to 10-II.....	4	27	19	4
11-0 to 11-II.....	.....	25	23	6
12-0 to 12-II.....	.....	21	16	5
13-0 to 13-II.....	.....	24	11	6
14-0 to 14-II.....	.....	15	16	10
15-0 to 15-II.....	.....	7	11	4
16-0 to 16-II.....	.....	3	.....	3
17-0 to 17-II.....	.....	.....	.....	.....
Total.....	101	215	155	45
Mean.....	8 yrs., 4 mos.	10 yrs., 9 mos.	11 yrs., 1 mo.	12 yrs., 8 mos.

TABLE II  
DISTRIBUTIONS OF MENTAL AGES OF CONTROL  
CHILDREN AND READING-DEFECT CASES

Years and Months of Mental Age	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
5-0 to 5-II.....	.....	2	.....	.....
6-0 to 6-II.....	.....	9	2	1
7-0 to 7-II.....	7	38	8	4
8-0 to 8-II.....	30	43	17	10
9-0 to 9-II.....	38	50	34	12
10-0 to 10-II.....	15	36	23	11
11-0 to 11-II.....	9	17	23	4
12-0 to 12-II.....	2	6	17	2
13-0 to 13-II.....	.....	5	13	1
14-0 to 14-II.....	.....	4	6	.....
15-0 to 15-II.....	.....	3	4	.....
16-0 to 16-II.....	.....	.....	5	.....
17-0 to 17-II.....	.....	2	3	.....
Total.....	101	215	155	45
Mean.....	9 yrs., 5 mos.	9 yrs., 6 mos.	11 yrs., 0 mos.	9 yrs., 8 mos.

which the Kuhlmann revision of the Binet tests was substituted. The mental ages of the reading cases had a wider distribution than

those of the control. The mean mental ages of the clinic and defective reading cases were about the same as that of the controls, but the mean of the special reading cases was over a year in advance of that of the controls.

The mean intelligence quotients of the groups show some discrepancies which can probably be explained by the differences in sampling. The mean intelligence quotient of the clinic reading cases is about ten to fifteen points above the mean quotient for

TABLE III  
DISTRIBUTIONS OF INTELLIGENCE QUOTIENTS OF CONTROL  
CHILDREN AND READING-DEFECT CASES

I.Q.	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
150-59.....	1	.....	.....	.....
140-49.....	1	.....	1	.....
130-39.....	8	.....	5	.....
120-29.....	17	10	11	.....
110-19.....	27	17	20	.....
100-109.....	26	34	37	4
90-99.....	14	49	44	2
80-89.....	6	45	32	8
70-79.....	1	35	4	20
60-69.....	.....	20	1	9
50-59.....	.....	5	.....	2
40-49.....	.....	.....	.....	.....
Total.....	101	215	155	45
Mean.....	111.4	90.4	100.9	77.4

all the Institute for Juvenile Research cases;<sup>1</sup> the mean quotient of the special reading cases is about that found by Terman<sup>2</sup> for unselected children; and the mean quotient of the mentally inferior group is slightly above the mean that one might reasonably expect in special classes for subnormals. The control cases are slightly superior to the general population, probably owing to particular factors in the specific communities from which they were chosen. In excluding districts of foreign population, the milling and industrial communities were also excluded, making it

<sup>1</sup> Luton Ackerson, *Children's Behavior Problems* (University of Chicago Press, 1931), I, 22.

<sup>2</sup> L. M. Terman, *The Measurement of Intelligence* (Houghton Mifflin Co., 1916), p. 66.

necessary to choose schools among the better occupational districts.

It appears that the reading-defect cases are fairly typical in their intelligence-test scores of the samplings of population from which they are selected. The reading defects may occur at any intellectual level from very superior to very inferior, as measured by intelligence tests.

#### MEASUREMENT OF READING DEFECTS

Before we can compare the severity of the reading defects of two children or of the same child before and after remedial treatment, we must have a method of measuring the extent of the defect. We must measure the child's reading achievement and then determine whether or not this achievement is in harmony with his other achievements. We cannot conveniently measure all his other accomplishments, but we can take a sampling of them. We must know, furthermore, the relationships which exist between reading and the other measures in order to determine the child's expectation in reading.

A measure of the child's reading achievement is more accurate for our purpose if several kinds of reading skills are considered. We selected in this study a series of six reading tests. Gray's Oral Reading Paragraphs<sup>1</sup> measures the ability to read increasingly difficult paragraphs aloud. The score for each paragraph read in the test is obtained from a chart which takes into account both time and errors. The total paragraph score for the child is transmuted into a grade score, which designates the child's level of reading in terms of the school unit of grades. The test ranges from the first to the eighth grade. The Haggerty Reading Examination, Sigma 1, Test 2,<sup>2</sup> measures the ability to read silently and underline the correct answer, "Yes" or "No," to questions of varying difficulty within a given time limit. The score is the number of right answers minus the number of wrong answers (see Appendix). The test ranges from the first to the fourth grade. The Monroe Silent Reading Examination<sup>3</sup> measures the ability to read silently.

<sup>1</sup> Bloomington, Ill.: Public School Publishing Co.

<sup>2</sup> Chicago: World Book Co.      <sup>3</sup> Bloomington, Ill.: Public School Publishing Co.

Each paragraph is followed by a question and several words, the appropriate one of which is to be underlined. A time limit is placed on the test. The score for comprehension is the number of words correctly underlined. The test ranges from the third to the eighth grade. In our procedure we gave either the Haggerty or the Monroe test—Haggerty if the child's reading was below third grade, and Monroe if above third grade. The Iota Word Test<sup>1</sup> measures the ability to read isolated words accurately. The score is the number of words correctly read (see Appendix). The test ranges from the first to the fifth grade. The Word Discrimination Test<sup>2</sup> measures the ability to select the correct words from lists of confusion words. The score is the number of words correctly discriminated (see Appendix). All the reading tests were so standar-dized that comparable grade scores could be obtained. The Stanford Achievement Test in Reading<sup>3</sup> was substituted whenever the child's reading score was above the norms of any of the previous tests.

The grade scores made on the foregoing series of tests were noted for each child. Usually the scores on all the tests by any one child were found to be within fairly close agreement with one another, although occasionally there was a discrepancy between the scores. For example, there were children who made good oral-reading scores but who failed to make good scores on the comprehension test in silent reading, and there were others whose ability to read and discriminate isolated words was very poor in comparison with their ability to read paragraph or content material.

An average of the grade scores obtained by a child on all the tests was selected as a measure of his reading achievement. Cor-relation coefficients were obtained for the control group between each test and the average of the tests to determine the relation-ship of each skill to the composite achievement.

<sup>1</sup> Marion Monroe, *Methods for Diagnosis and Treatment of Cases of Reading Dis-ability*, "Genetic Psychology Monographs" (Clark University Press), Vol. IV, Nos. 4 and 5, Oct.-Nov., 1928; *Diagnostic Reading Test* (Chicago: C. H. Stoelting Co.).

<sup>2</sup> *Diagnostic Reading Test* (Chicago: C. H. Stoelting Co.).

<sup>3</sup> World Book Co.

The Pearson  $r$  coefficients for the tests are as tabulated here.

	Correlation with Average of Tests
Gray's Oral Reading Examination .....	$r = .89 \pm .013$
Haggerty Reading Test, Sigma 1, Test 2 .....	$r = .88 \pm .013$
Monroe Silent Reading Test .....	$r = .87 \pm .015$
Iota Word Test .....	$r = .92 \pm .009$
Word-Discrimination Test .....	$r = .90 \pm .009$

The correlation coefficients are all high and within a range of five points.

#### DISCREPANCIES BETWEEN READING AND CHRONOLOGICAL AGE

We next compared each child's actual reading achievement with that expected from various criteria. An easily obtained criterion of the child's development is his chronological age. As children grow older, they generally increase in reading achievement as well as in mental maturity and in other scholastic accomplishments. A measure of the discrepancy between reading and age would give an indication as to whether or not the child has a reading defect. The correlation coefficients (Pearson  $r$ ) between the composite or average reading grade score and chronological age were found to be: controls,  $0.09 + .066$ ; clinic reading cases,  $0.42 \pm .041$ ; and special reading cases,  $0.45 \pm .058$  for three groups of children. The discrepancies between the correlation coefficients of the controls and reading cases were due, probably, to the different age ranges of the groups, and the greater heterogeneity of age in the reading cases.

We wished to know how each child's reading achievement compared with the achievement we should expect from his age. The difference between his age-grade placement and his reading-grade placement gave us a measure of the disparity between reading and age. In order to make such a computation it was necessary to transmute ages into grade units. This transmutation was accomplished by means of an age-grade table (see Appendix). The discrepancies between reading achievement and age are shown in Table IV, in which the positive signs refer to accelerated reading and the negative to retarded reading. For example, looking at the

top of the table, we find that one child of the controls had a reading achievement 3.0-3.4 grades in advance of his age; looking at the bottom of the table, we find that one child of the clinic reading cases and one of the defective reading cases had a reading achievement 9.6-10.0 grades below his age.

TABLE IV  
DISCREPANCIES BETWEEN CHRONOLOGICAL AGE  
AND READING ACHIEVEMENT

No. of Grades Discrepancy between Reading and Age	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
+ 3.0-3.4.....	1	.....	.....	.....
+ 2.5-2.9.....	1	.....	.....	.....
+ 2.0-2.4.....	3	.....	.....	.....
+ 1.5-1.9.....	10	.....	.....	.....
+ 1.0-1.4.....	16	.....	.....	.....
+ 0.5-0.9.....	17	1	.....	.....
0.0-0.4.....	17	4	1	.....
- 0.5-0.1.....	15	3	4	.....
- 1.0-0.6.....	9	12	13	.....
- 1.5-1.1.....	5	15	19	.....
- 2.0-1.6.....	5	24	12	1
- 2.5-2.1.....	1	22	23	.....
- 3.0-2.6.....	.....	20	16	3
- 3.5-3.1.....	1	17	12	1
- 4.0-3.6.....	.....	20	14	3
- 4.5-4.1.....	.....	16	10	3
- 5.0-4.6.....	.....	11	10	3
- 5.5-5.1.....	10	.....	10	8
- 6.0-5.6.....	11	4	4	4
- 6.5-6.1.....	.....	8	3	4
- 7.0-6.6.....	.....	5	2	.....
- 7.5-7.1.....	.....	2	1	3
- 8.0-7.6.....	.....	8	1	4
- 8.5-8.1.....	3	.....	.....	3
- 9.0-8.6.....	.....	2	.....	4
- 9.5-9.1.....	.....	.....	.....	.....
- 10.0-9.6.....	1	.....	.....	1
Total.....	101	215	155	45
Mean.....	+0.35	-3.49	-2.94	-5.86

The control children show a normal distribution of discrepancies about their mean. Most of them have reading scores in the neighborhood of the level expected from their ages, but some are accelerated and others are to a similar extent retarded. The average discrepancy between reading and age is approximately four-tenths year's acceleration.

The means of the reading-defect cases all show considerable re-

tardation in reading for chronological age. Only 1 per cent of the control cases is as severely retarded with respect to chronological age as the average reading-defect case in our study.

Although a measure of the discrepancy between reading achievement and chronological age gives a good differentiation between the reading-defect cases and the controls, there are individuals who might be selected by this criterion who would fail to have a specific reading defect. The general defectives would all be included with the reading-defect cases if we were to select only age as our criterion. The generally subnormal child is below his age level in other of his mental capacities and achievements as well as in reading and could not be regarded as a case of special disability so long as his achievements are harmoniously low. The defective child could, however, have a reading defect in addition to his general subnormality if his reading achievements were still more retarded than his other accomplishments.

#### DISCREPANCIES BETWEEN READING AND MENTAL AGE

As a second measure of the reading defect, we compared the child's average or composite reading grade score with his mental age to note the extent to which his reading is accelerated or retarded. Mental age was found to correlate with reading more highly than chronological age. The Pearson  $r$ 's which we obtained between reading and mental age were : controls,  $0.60 \pm .042$ ; clinic reading cases,  $0.56 \pm .036$ ; special reading cases,  $0.65 \pm .034$ . The reason for the higher correlations may be partly due to the fact that, since reading has been considered as one of the measures of intelligence, the Stanford-Binet intelligence examination includes reading tests among its series of tests. A child with a special reading defect will necessarily be penalized on some of the tests.

In order to compare the child's mental age with his reading grade, it was necessary to transmute the mental age into a grade-equivalent score in the same manner in which we transmuted his chronological age (see Appendix). The discrepancies between mental age and reading are shown in Table V, in which positive signs indicate accelerated reading and negative signs indicate retarded reading.

The controls are normally distributed about their mean discrepancy, some cases being accelerated and others being retarded in reading with respect to mental age. The average discrepancy of the group is about 0.67 grade's retardation below mental age. This fact is interesting in comparison with the acceleration which the control children showed in reading with respect to chronological

TABLE V  
DISCREPANCIES BETWEEN MENTAL AGE AND  
READING ACHIEVEMENT

No. of Grades Discrepancy between Reading and Mental Age	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
+1.5+1.9	1	.....	.....	.....
+1.0+1.4	2	.....	.....	.....
+0.5+0.9	6	.....	.....	.....
0.0+0.4	16	4	.....	.....
-0.5-0.1	15	11	4	2
-1.0-0.6	24	18	12	2
-1.5-1.1	16	31	14	2
-2.0-1.6	10	39	24	4
-2.5-2.1	9	38	17	8
-3.0-2.6	1	26	19	8
-3.5-3.1	1	18	16	6
-4.0-3.6	.....	9	12	5
-4.5-4.1	.....	10	14	3
-5.0-4.6	.....	3	5	3
-5.5-5.1	.....	4	4	.....
-6.0-5.6	.....	3	4	.....
-6.5-6.1	.....	1	3	1
-7.0-6.6	.....	.....	3	1
-7.5-7.1	.....	.....	2	.....
-8.0-7.6	.....	.....	2	.....
Total	101	215	155	45
Mean	-0.67	-2.20	-2.93	-2.88

age. We recall that the children are young and have mental ages above their chronological ages. They are surpassing their chronological-age standards but have not yet reached their mental-age standards in reading.

The reading-defect cases show much greater discrepancies in reading with respect to mental age than do the controls. Their average discrepancies are from 2.2 to 2.9 years' retardation below mental age.

Although the discrepancy between mental and reading age gives a good differentiation between the controls and the reading-

defect cases, there are objections to using this criterion alone as a measure of reading defect, since the young bright child does not ordinarily have opportunity to reach his mental age in reading. A combination of the two criteria, chronological and mental age, would perhaps be better than either alone.

#### DISCREPANCIES BETWEEN READING AND ARITHMETIC

There are a few children who might not have special reading defects and who still might be retarded in reading below both chronological and mental ages. Children who are ill and miss a year of school, or children who have attentional or emotional instability with regard to all subjects, would be uniformly retarded in all scholastic achievements. It would be desirable to compare the child's reading achievement with his achievement in other subjects if we are to make sure that the reading defect is a specific one. For this reason we gave to each child a test of arithmetic, selecting the Stanford Achievement Test in Arithmetic Computation,<sup>1</sup> which has its scores transmuted into grade units.

The Pearson  $r$  correlation coefficients between reading and arithmetic were: controls,  $0.54 \pm .047$ ; clinic reading cases,  $0.55 \pm .042$ ; special reading cases,  $0.56 \pm .030$ . There is a positive correlation between reading and arithmetic which justifies using arithmetic as an additional criterion of expected achievement in reading.

The number of grades discrepancy between each child's reading and arithmetic achievement was calculated and the distributions are shown in Table VI, in which positive signs refer to accelerated reading and negative signs to retarded reading.

The discrepancies of the controls are distributed about their mean, some of the children being accelerated and others being retarded in reading with respect to arithmetic. The average discrepancy was approximately one-third grade's acceleration in reading.

The reading-defect cases are, on the average, retarded in read-

<sup>1</sup> Chicago: World Book Co.

ing below arithmetic, from approximately one and one-fourth to one and three-fourths grades.

In addition to comparing reading with chronological age, mental age, and arithmetic, we also compared it with spelling, choosing the Ayers Spelling Scale and transmuting scores into grade units (see Appendix).

TABLE VI  
DISCREPANCIES BETWEEN ARITHMETIC AND READING ACHIEVEMENT

No. of Grades Discrepancy between Reading and Arithmetic	Controls	Clinic Reading Cases	Special Reading Cases	Defective Reading Cases
+2.0 to +2.4.....	2	.....	.....	.....
+1.5 to +1.9.....	9	.....	.....	.....
+1.0 to +1.4.....	9	1	2	.....
+0.5 to +0.9.....	23	4	4	.....
0.0 to +0.4.....	23	10	7	1
-0.5 to -0.1.....	13	28	18	2
-1.0 to -0.6.....	15	38	37	7
-1.5 to -1.1.....	7	44	27	8
-2.0 to -1.6.....	.....	38	22	11
-2.5 to -2.1.....	.....	20	15	8
-3.0 to -2.6.....	.....	12	7	3
-3.5 to -3.1.....	.....	4	4	3
-4.0 to -3.6.....	.....	1	7	2
-4.5 to -4.1.....	.....	4	2	.....
-5.0 to -4.6.....	.....	1	2	.....
-5.5 to -5.1.....	.....	1	1	.....
-6.0 to -5.6.....	.....	.....	.....	.....
Total.....	101	215	155	45
Mean.....	+.30	-1.26	-1.38	-1.74

#### DISCREPANCIES BETWEEN READING AND SPELLING

The Pearson  $r$ 's between reading and spelling were: controls,  $0.81 \pm .023$ ; clinic reading cases,  $0.85 \pm .016$ ; special reading cases,  $0.85 \pm .015$ . The correlation coefficients are so high that it seems that we must be measuring an achievement which is greatly dependent either upon reading or upon the same factors which underlie the ability to read. Discrepancies between spelling and reading were not much greater than were discrepancies between the composite reading score and some of the separate reading skills from which the composite was calculated. Spelling, therefore, may be considered as one of the skills which is highly related to reading.

## THE READING INDEX

In order to arrive at a single measure of the reading defect we took a combination of the three criteria of reading, chronological age, mental age, and arithmetic. We obtained a reading index by comparing the child's composite reading grade with his average chronological, mental, and arithmetic grade. The calculation of the reading index will be illustrated by two cases. Mary's chronological age gives her a grade placement of 3.5; her mental age gives her a placement of 4.0; her arithmetic is 3.6. The average of these accomplishments is 3.7. Her grade scores on four reading tests were 2.1, 2.5, 1.8, and 2.0, with an average of 2.1. Her reading achievement is therefore only  $2.1/3.7$  of her expectation, or 0.56, which score we shall designate as the "reading index." Mary's reading is, in other words, only 56 per cent of the expectation from her maturity, her ability in a variety of mental-test situations, and her ability in arithmetic. John's chronological age would place him in grade 5.6; his mental age in grade 4.8; his arithmetic in 5.0. The average of these accomplishments is 5.1. His scores on four reading tests were 6.1, 7.2, 5.1, and 4.9, with an average of 5.8. His reading achievement is  $5.8/5.1$  of the expectation, or his reading index is 1.13.

In the manner described above, the reading indices of the children were calculated. The three groups of reading-defect cases were found to have highly similar distributions of scores and were therefore placed together in one distribution. The frequency curves for the reading-defect cases and the controls are shown graphically in Figure 1. Since there are many more children in the reading-defect group than in the control, the frequencies are charted on a percentage scale which would make the two distribution curves of comparative height.

The reading index discriminates very well between the reading-defect cases and the controls. The controls show a normal distribution about their mean index of 1.02. A priori, we should expect the controls to have a mean reading index of 1.00, which would indicate perfect harmony between reading and other accomplishments. Our controls proved to be slightly superior in reading to their other accomplishments, but this superiority is

probably a chance one, as the difference between means of 1.02 and 1.00 would not be statistically significant for the number of cases studied. The mean reading index of the reading-defect cases is 0.49, which is 2.75 standard deviations below the mean of the controls.

Using the reading index as a measure of the variation between a child's reading and his other accomplishments, we may draw

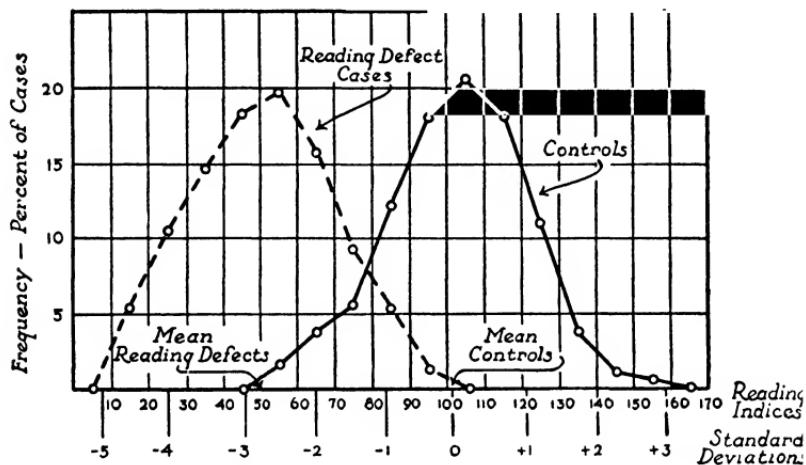


FIG. 1.—Distributions of reading indices

several conclusions with regard to reading defects. In the general population there is no hard-and-fast line of demarcation between reading-defect cases and normal readers. There are all degrees of gradation from very severe discrepancies between reading and other accomplishments to very mild disparities. The discrepancies may run in either direction above or below, and the reading index gives a measure of acceleration (or special talents for reading) as well as special defects.

#### FREQUENCY OF READING DEFECTS

To the question "How frequent are reading defects in the general population?" we may reply that they are many or few according to the degree of severity of the defect. Any point of demarcation will be more or less subjective and dependent upon our practical experience with these children. Just as the line of demarca-

tion between defective and normal intelligence is drawn at various points along the line of intelligence-test scores, depending upon the purpose for which the children are to be selected, such as in-

TABLE VII  
STANDARD DEVIATIONS AND PERCENTILE  
RANKS OF READING INDICES

Reading Index	Standard Deviation	Percentile Rank	Reading Index	Standard Deviation	Percentile Rank
I.59.....	+3.0	99.9			
I.58.....	+2.9	99.8	0.83.....	-1.0	15.9
I.56.....	+2.8	99.7	.81.....	1.1	13.6
I.54.....	+2.7	99.6	.79.....	1.2	11.6
I.52.....	+2.6	99.5	.77.....	1.3	9.7
I.50.....	+2.5	99.3	.75.....	1.4	8.1
I.48.....	+2.4	99.1	.73.....	1.5	6.7
I.46.....	+2.3	98.9	.71.....	1.6	5.5
I.44.....	+2.2	98.6	.69.....	1.7	4.5
I.42.....	+2.1	98.2	.67.....	1.8	3.6
I.40.....	+2.0	97.7	.65.....	1.9	2.9
I.38.....	+1.9	97.1	.64.....	2.0	2.3
I.36.....	+1.8	96.4	.62.....	2.1	1.8
I.34.....	+1.7	95.5	.60.....	2.2	1.4
I.32.....	+1.6	94.5	.58.....	2.3	1.1
I.31.....	+1.5	93.3	.56.....	2.4	0.9
I.29.....	+1.4	91.9	.54.....	2.5	0.7
I.27.....	+1.3	90.3	.52.....	2.6	0.6
I.25.....	+1.2	88.4	.50.....	2.7	0.5
I.23.....	+1.1	86.4	.48.....	2.8	0.3
I.21.....	+1.0	84.1	.46.....	2.9	0.2
I.19.....	+0.9	81.5	.45.....	3.0	0.1
I.17.....	+0.8	78.8	.43.....	3.1	
I.15.....	+0.7	75.8	.41.....	3.2	
I.13.....	+0.6	72.5	.39.....	3.3	
I.12.....	+0.5	69.1	.37.....	3.4	
I.10.....	+0.4	65.5	.35.....	3.5	
I.08.....	+0.3	61.7	.33.....	3.6	
I.06.....	+0.2	57.9	.31.....	3.7	
I.04.....	+0.1	53.9	.29.....	3.8	
I.02.....	0.0	50.0	.27.....	3.9	
I.00.....	-0.1	46.1	.26.....	4.0	
0.98.....	-0.2	42.1	.24.....	4.1	
0.96.....	-0.3	38.3	.22.....	4.2	
0.94.....	-0.4	34.5	.20.....	4.3	
0.92.....	-0.5	30.9	.18.....	4.4	
0.90.....	-0.6	27.5	.16.....	4.5	
0.88.....	-0.7	24.2	.14.....	4.6	
0.86.....	-0.8	21.2	.12.....	4.7	
0.84.....	-0.9	18.5	0.10.....	-4.8	

Less than 1  
per  
1,000

stitutionalization, or special-room placement, etc., so the reading defects may be separated from the others at the point most suitable for the purpose desired. In our experience we find that the

point at which the two frequency curves intersect (reading index of approximately 0.80) is a good point of separation. The children with reading indices below 0.80 are almost always so seriously maladjusted as to need correctional work. Children with reading indices between 0.80 and 0.90 may be considered as borderline cases, some of whom may be unable to become adjusted without corrective instruction, others of whom may be able to carry on their school work without special help. Using a reading index of 0.80 as a point of separation, we assume that about 12 per cent of the general population have reading defects, if we may draw such conclusion from our group of controls.

In many cases it is interesting to know the child's position in the group with regard to his reading index. Table VII gives the reading index scores in terms of standard deviations from the mean and of percentile ranks. The use of the table is demonstrated by the following example: A child whose reading index is 1.38 has a position of +1.9 standard deviations, or surpasses ninety-seven children out of one hundred. A child whose reading index is 0.65 has a position of -1.9 standard deviations, or surpasses only three children in one hundred.

#### READING INDICES AND INTELLIGENCE QUOTIENTS

The reading index, although resembling the intelligence quotient somewhat in its distribution and in its limits, does not correlate very highly with it. The Pearson  $r$  obtained between reading indices and intelligence quotients for the controls was  $+.27 \pm .063$ . It seems that we are measuring a discrepancy between reading and other accomplishments which may occur in either direction at any intellectual level. There is, however, a tendency for the children whose reading achievements are above expectation to have somewhat higher intelligence quotients than the children whose reading achievements are below expectation.

#### RELIABILITY OF THE READING INDEX

The reading index is very reliable. Fifty children were retested at periods within six months of the original test. The reliability coefficient (Pearson  $r$ , first test correlated with retest) was found to be  $.94 \pm .011$ .

## CHAPTER II

### TYPICAL INDIVIDUAL CHARTS SHOWING DISCREPANCIES BETWEEN READING AND OTHER ACCOMPLISHMENTS

In the preceding chapter we have pointed out the fact that children vary in reading achievement as compared with their other accomplishments. We have presented a method for measuring the discrepancy which may be used to determine the degree of retardation or acceleration in reading. In an analysis of any individual's reading, it is helpful to portray his accomplishments graphically so that the relationships between them may be readily perceived. The grade scores on the series of tests which are described in the first chapter may be arranged in the form of an educational profile for each child, from which the observer can tell at a glance the high and low points of his achievements. We have selected a series of eighteen profiles which illustrate some of the types of variation which were encountered among the children studied. The charts show not only special talents and specific difficulties in reading but also different abilities in the various reading skills.

The charts were made by plotting the child's grade scores derived from the tests on the age-grade scale. The reading tests are designated by the following symbols: *O*, oral reading as measured by Gray's Oral Reading Paragraphs; *C*, comprehension of silent reading as measured by the Haggerty test in cases of less than third-grade reading achievement, or by the Monroe test in cases of more than third-grade reading achievement; *W.A.* for word analysis as measured by the Iota Word Test; and *W.D.* for word discrimination as measured by the Word-Discrimination Test.

#### EDUCATIONAL PROFILES OF CHILDREN OF SUPERIOR INTELLIGENCE

*Case 1* (Fig. 2).—Allen is a little boy who has unusual talent for reading. He was in the second grade at school when examined, although he was only

six years and seven months of age. On the Stanford-Binet Intelligence Test he earned a mental age of seven years and ten months, I.Q. 119. The arithmetic score indicated third grade. His average reading-test score was fourth grade, with a reading index of 1.54. He made exceptionally high scores in oral reading and word tests, but was about average for his grade in comprehension of material read silently. He was reported by his teacher as a "little genius." He had an eager manner and was critical of his responses on the tests. In reply to questions regarding his reading he said, "I learned to read before I came to school. Nobody taught me. I just learned it. It's easy." He seemed to have had no systematic instruction in reading. He came to school pre-

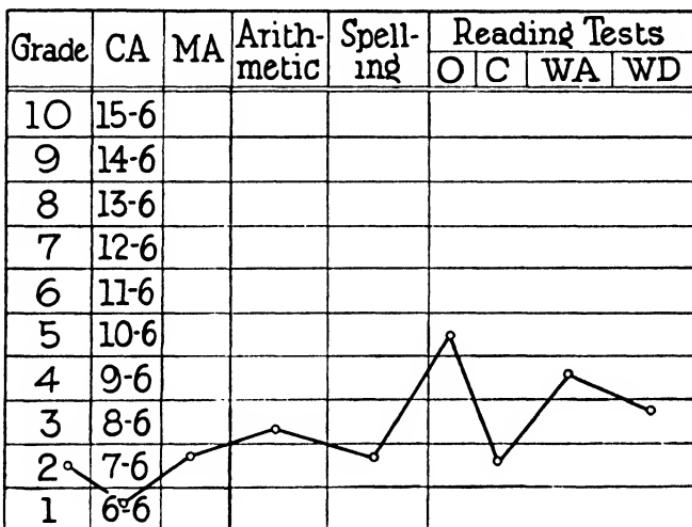


FIG. 2.—Case 1, Allen. Reading index, 1.54

pared to enter first grade but the teacher, on discovering his ability in reading, placed him in the second grade.

*Case 2* (Fig. 3).—Donald is a little boy in the second grade, promoted from the first grade conditionally, because of poor reading. He was seven years and two months of age when examined, with a mental age of nine years and three months, I.Q. 129. The arithmetic score indicated third grade. His average reading score was low second grade, with a reading index of 0.68. He showed exceptionally good reasoning ability in arithmetic, and in the tests of the Stanford-Binet series. When he was presented with the reading tests he asked, "Will you let me take these home and study them first?" When urged to go ahead without study, a strained expression came over his face and he said, "Do you think my reading is good enough for me to get promoted? I know all the stories but I can't get the words." His behavior

was reported as good and his social adjustment as excellent. His teacher regarded him as "perhaps a little backward but a nice child." This case is interesting in contrast with the previous one, as it indicates the differences between two children of superior test intelligence, one of whom is talented in reading, the other of whom has a serious reading defect which is beginning to cause emotional tension and which, if uncorrected, may lead to future maladjustment. The intelligence quotients of the two children are high; they are both anxious to get ahead, and are ambitious, steady workers. The difference in their school adjustments seems primarily explainable on the basis of the difference in their ability to learn to read.

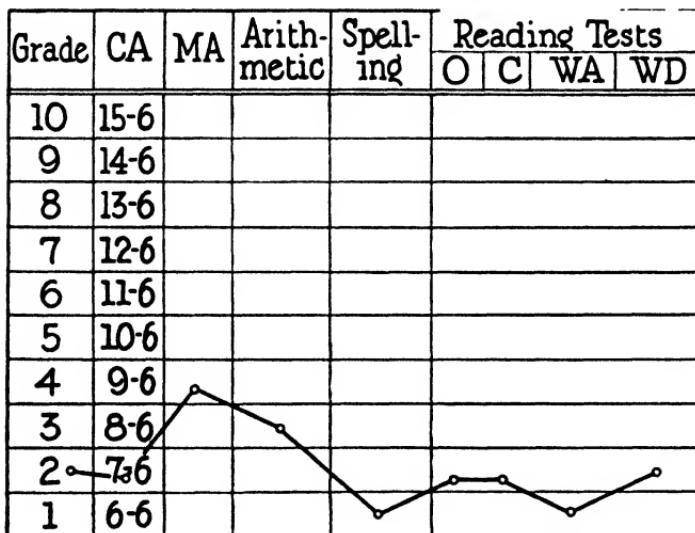


FIG. 3.—Case 2, Donald. Reading index, 0.68

*Case 3* (Fig. 4).—Betty represents a case of reading retardation in a very bright little girl. She was completing the second year in school without having been able to learn to read. When examined she was seven years and four months of age, with a mental age of ten years, I.Q. 135. Arithmetic measured high second grade. Reading and spelling measured very low first grade, her reading index being 0.41. She had a most engaging manner and had learned many ways of diverting attention from the fact that she could not read. When the reading tests were presented she pushed them aside and said, "Let's don't do any reading. I know some arithmetic games that are lots of fun. Please teach me some third-grade arithmetic problems." When finally persuaded to attempt the tests she showed considerable emotional tension, clearing her voice, saying "ah" several times before attempting each word, and flushing over her obvious errors.

*Case 4* (Fig. 5).—Charles is a boy who on entering first grade was given the Stanford-Binet examination and earned an I.Q. of 130. Four years later he was referred for a study of his reading retardation. He was then nine years and ten months of age, had been held back one year at school, repeating the second grade, and was placed in the third grade. He was not a behavior problem at school but was an extremely discouraged boy, except in mechanical activities, in which he excelled. The Stanford-Binet examination was repeated. His mental age was found to be eleven years and one month, I.Q. 112. The discrepancy between the two intelligence quotients may be explained by a number of factors, among them his discouraged passive attitude to tests at

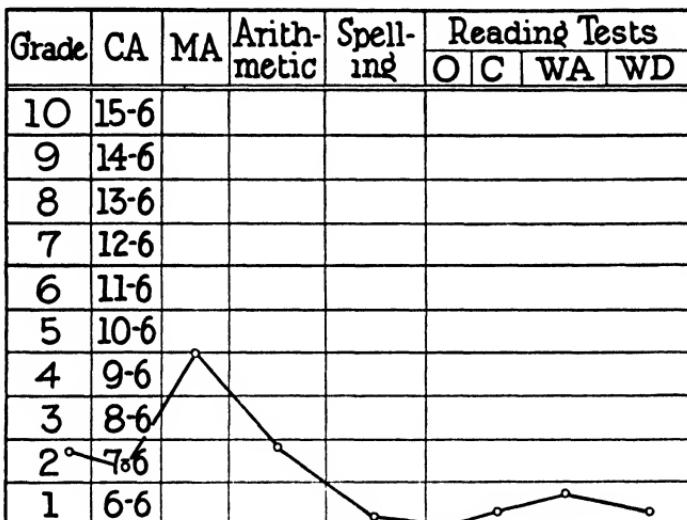


FIG. 4.—Case 3, Betty. Reading index, 0.41

the last examination and his insecurity in his own knowledge which caused him to change his replies to questions, delaying over tests beyond the time limit allowed. He also naturally encountered more of the reading and vocabulary tests of the Stanford-Binet examination at nine years of age than he had previously at six years of age, which fact would tend to penalize his score at the latter examination. Arithmetic measured high third grade; reading measured low second grade, with a reading index of 0.50. He commented on the reading tests, "I wish I could learn to read but I guess I'm too dumb." In this case the promise of superiority shown by the early test rating was not fulfilled, primarily because of the difficulty the child had in learning to read, with the attendant emotional disturbance and discouragement of failure.

*Case 5* (Fig. 6).—Mable is a girl of superior test intelligence who was in the seventh grade in junior high school at the time of examination. She was eleven years and ten months of age, with a Stanford-Binet mental age of

fourteen years and six months, I.Q. 122. Arithmetic measured superior, as she received a score of ninth grade in this subject. Reading measured only

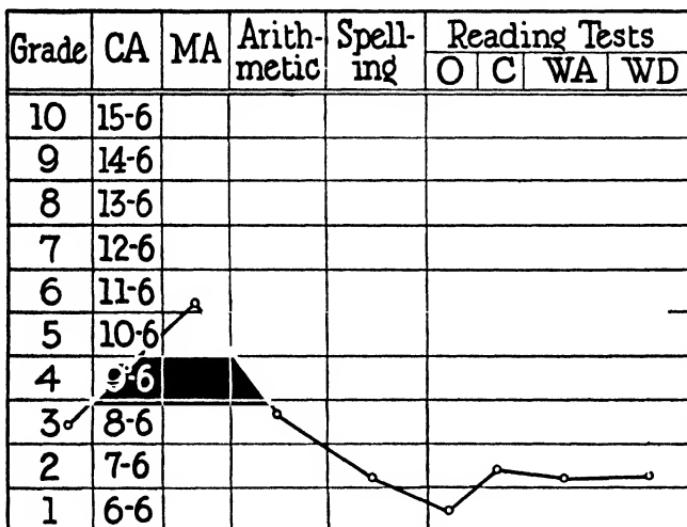


FIG. 5.—Case 4, Charles. Reading index, 0.50

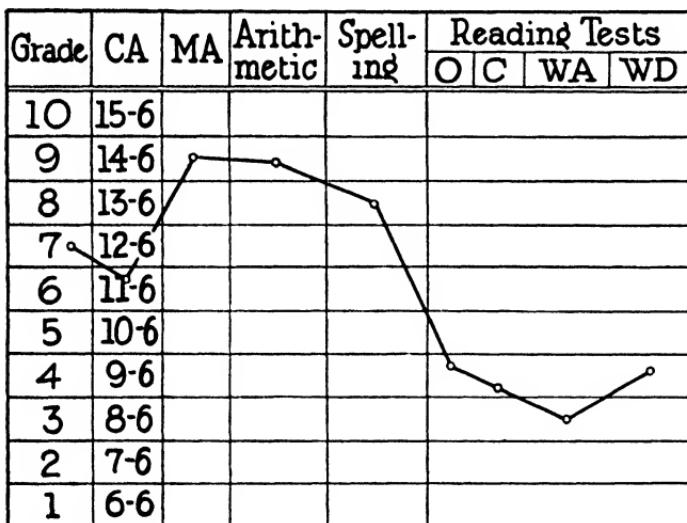


FIG. 6.—Case 5, Mable. Reading index, 0.52

fourth grade, with an index of 0.52. Unlike most reading-defect cases, Mable could spell much better than she could read, scoring eighth grade in spelling. Her school problem was centered around the English class. All her teachers

spoke highly of her ambition, her social leadership, and her general character traits with the exception of her English teacher. The English teacher questioned her honesty since she found her copying other pupils' book reports and trying to give the impression of having read books which she really had not read. The child admitted the deception tearfully, but said that she read so slowly and with so many mistakes that it was impossible for her to read more than a few pages in an evening, and hence she could not complete the books required. In this case the child's school problem seems to be closely related to her reading handicap.

EDUCATIONAL PROFILES OF CHILDREN  
OF AVERAGE INTELLIGENCE

The previous charts, with the exception of Case 1, have been those of children of superior intelligence, as measured by an intelligence test, who are making inferior school adjustments.

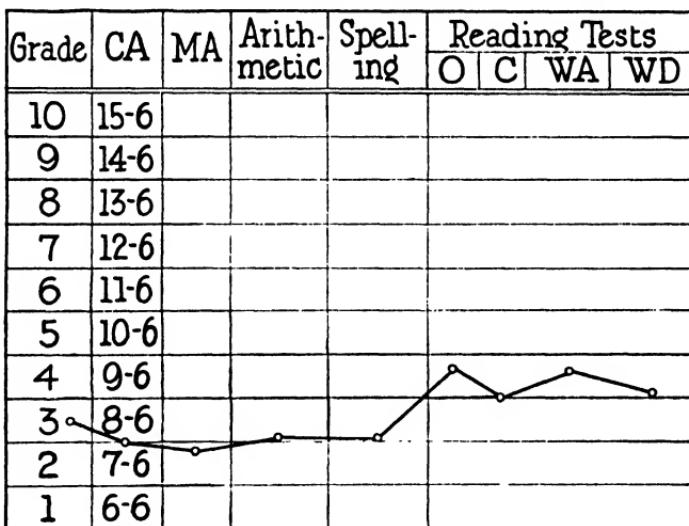


FIG. 7.—Case 6, Henry. Reading index, 1.40

The children of superior mental capacity who fail to learn to read are, of course, spectacular examples of specific reading difficulty since they have such obvious abilities in other fields. The majority of our reading-defect cases are not superior, however, and do not have the compensation of other mental talents.

*Case 6* (Fig. 7).—Henry is a little boy of just average intelligence but who is making a superior school adjustment. When examined he was eight years

and no months of age, with a Stanford-Binet mental age of seven years and eleven months, I.Q. 99. He was in the third grade, doing satisfactory third-grade arithmetic and spelling, but was able to score fourth grade in reading, having a reading index of 1.40. It is interesting to compare his educational profile with that of the previous case, Mable, since the two children have the same average reading grade score on a battery of reading tests, in spite of the other wide discrepancies between them.

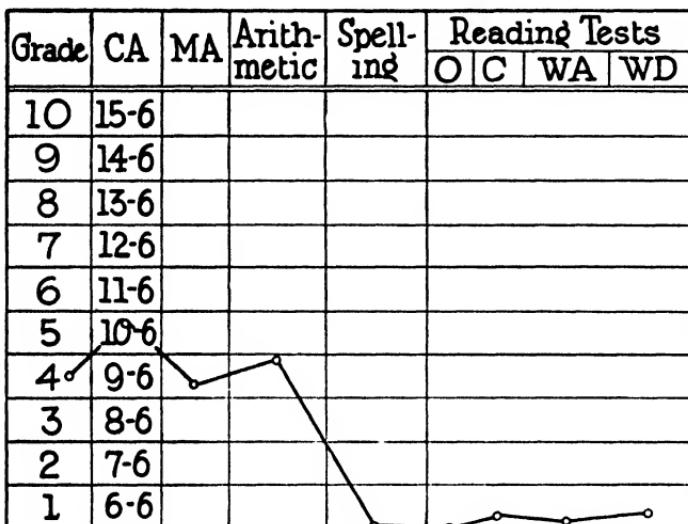


FIG. 8.—Case 7, Jim. Reading index, 0.26

*Case 7* (Fig. 8).—Jim is a boy of low average intelligence. When examined he was ten years and nine months of age, with a Stanford-Binet mental age of nine years and two months, I.Q. 92. He was in the fourth grade at school, and made a high fourth-grade score in arithmetic. Reading and spelling tests indicated very low first grade, with a reading index of 0.26. When presented with the reading tests he said, "You don't need to expect much from me. But I can beat up any kid in my room. I do, too, if they laugh at my readin'!" Jim has a serious reading handicap but maintains his social prestige by his dominant personality and physical prowess.

*Case 8* (Fig. 9).—Harold is a boy of fifteen years and one month of age. When examined he was in the eighth grade in a junior high school. His mental age on the Stanford-Binet test was fourteen years and five months, I.Q. 96. Harold came to the examination with the air of a martyr. His attitude seemed to express the thought which he had previously confided to his mother, "What's the use of all this? It just means struggle all over again. Nothing has ever helped my reading. Think of all the tutors I've had! I can't get it.

"Why not let me be?" The examination revealed an average reading achievement of second grade, reading index 0.34. In arithmetic he was also considerably retarded for his age, but was almost three grades in advance of

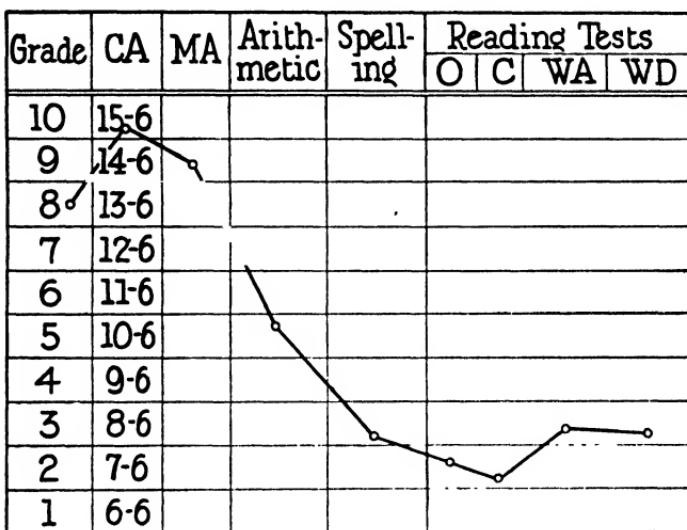


FIG. 9.—Case 8, Harold. Reading index, 0.34

reading. His knowledge of content subjects was built up by listening while members of the family read his lessons aloud. This case represents a severe reading defect in an older boy who has been able to progress to junior high school in spite of his serious reading disability.

#### EDUCATIONAL PROFILES OF CHILDREN OF DULL AND INFERIOR INTELLIGENCE

The children of dull and inferior intelligence who have a reading handicap in addition to their other inadequacies present difficult problems for school adjustment. It is necessary to discriminate carefully between a true reading-defect case and the child whose reading is poor for his age but who is, nevertheless, doing as well as would be expected from other achievements.

In the lower intellectual levels we find some of the same discrepancies between reading and other achievements that have been pointed out in the higher intellectual levels.

*Case 9* (Fig. 10).—Marjorie is a child whose reading is below her age although it is commensurate with her general accomplishments. She was

nine years of age when examined, with a Stanford-Binet mental age of seven years and six months, I.Q. 84. Her arithmetic achievement measured second grade, which was also her school placement. Her average reading grade score was also second grade, with a reading index of 0.96. She is adjusting happily at school and, although she is retarded for her age, she is doing as well as would be expected in the light of her general backward development.

Grade	CA	MA	Arith-metic	Spell-ing	Reading Tests			
					O	C	WA	WD
10	15-6							
9	14-6							
8	13-6							
7	12-6							
6	11-6							
5	10-6							
4	9-6							
3	8-6							
2	7-6							
1	6-6							

FIG. 10.—Case 9, Marjorie. Reading index, 0.96

*Case 10* (Fig. 11).—Cecil, a child of approximately the same intellectual level as Marjorie, has had great school difficulty and a court experience because of continual truancy during the past year. When examined he was twelve years of age, with a Stanford-Binet mental age of ten years and no months, I.Q. 83. He had never passed beyond the first grade at school except for occasional sojourns in subnormal rooms. His arithmetic achievement measured third grade. Reading measured practically zero, his average reading score being very low first grade, with a reading index of 0.25. His severe reading defect was closely related to his desire for escape from school.

*Case 11* (Fig. 12).—Frieda is a little girl who has learned to read much better than we would expect from her general comprehension as measured by the Stanford-Binet test. She was eight years and eight months of age when examined, with a mental age of four years and six months, I.Q. 52. Her school achievements were all at the first- and second-grade levels, with a reading index of 1.20. This case illustrates a special talent for reading in a defective child whose mental age would ordinarily be considered too low to attempt reading.

*Case 12 (Fig. 13).*—Roy is rated as a borderline defective child in intelligence. He was fifteen years and one month of age when examined, with a

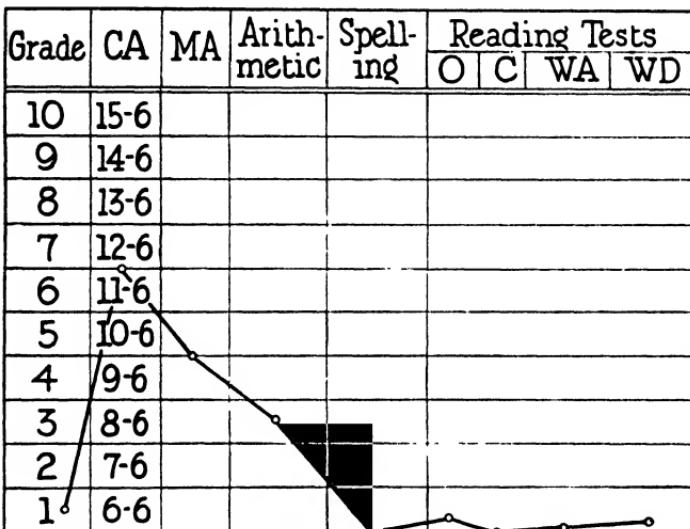


FIG. 11.—Case 10, Cecil. Reading index, 0.25

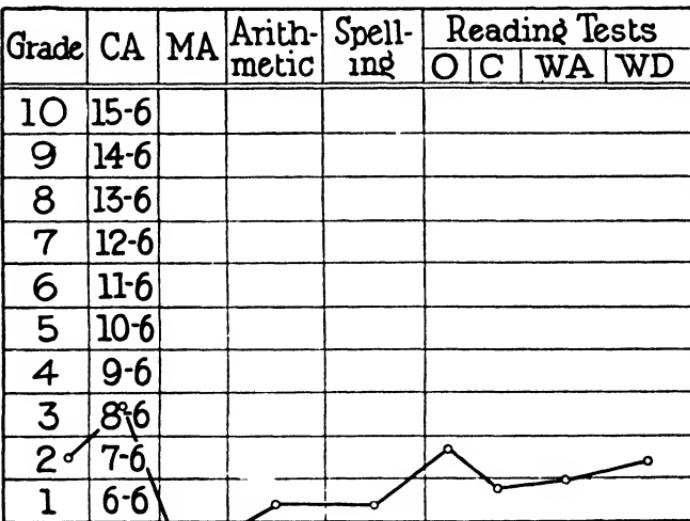


FIG. 12.—Case 11, Frieda. Reading index, 1.29

mental age of ten years and eleven months on the Kuhlmann-Binet test, I.Q. 73. We should expect a child whose mental age is ten years to be able

to do the work of fifth grade. Roy made a fifth-grade arithmetic score. Reading measured only low first grade, the reading index being 0.18. If the reading defect could be overcome, Roy's mental capacity would be sufficient to read the newspapers, street signs, advertisements, notices, etc., which ability would enable him to make a much better economic adjustment than he will make as a totally illiterate person. He is an industrious and reliable boy in spite of his serious limitations.

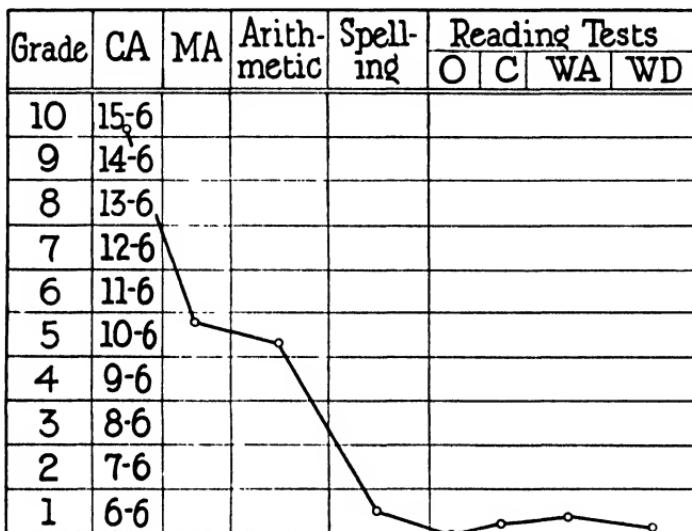


FIG. 13.—Case 12, Roy. Reading index, 0.18

*Case 13 (Fig. 14).*—Bob is a child of inferior mental capacity as measured by the Stanford-Binet test. He was fourteen years and eight months of age when examined, with a mental age of ten years, I.Q. 68. Although we should expect a boy of his mental age to be able to score fifth grade in his achievements, he made a score of eighth grade in arithmetic. Reading measured third grade, and his reading index was 0.48. This child may be considered as a case of special aptitude in arithmetic, at the same time having special difficulty with reading. It is difficult, of course, to evaluate the mental-test results in cases of such wide discrepancies. Whether this boy's true intellectual capacity is adequately measured by the Stanford-Binet test is, of course, questionable. In this study we consider the intelligence test as a type of achievement test and, in referring to intelligence ratings, we are referring to the intelligence required for the satisfactory accomplishment of the particular items involved in the test series. Bob was given as a part of the routine clinical procedure the Arthur Point Performance Test, in which he earned a

mental age of eleven years and six months, I.Q. 78, a higher rating than he achieved on the Stanford-Binet, but one which is still incommensurate with his skill in arithmetic.

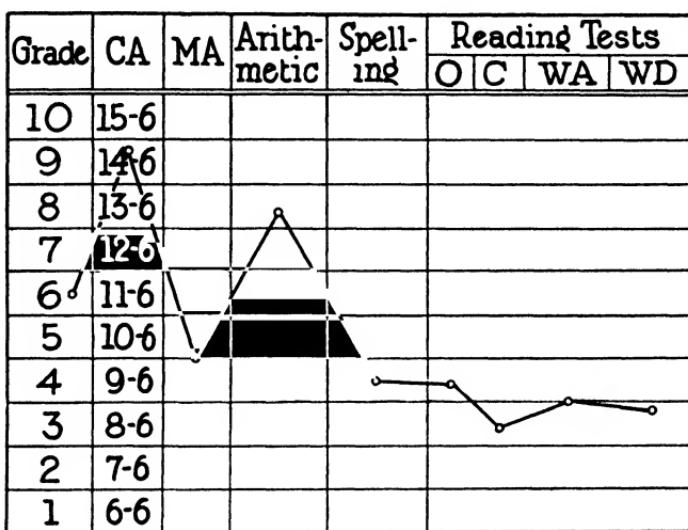


FIG. 14.—Case 13, Bob. Reading index, 0.48

#### EDUCATIONAL PROFILES SHOWING DISCREPANCIES BETWEEN THE READING SKILLS

Even among the various reading skills which show high correlations with one another we found many discrepancies in individual cases. Spelling was found to correlate so highly with reading that it may be considered as one of the reading skills. There were, nevertheless, a number of children whose spelling scores deviated widely from their reading scores. Case 5, Mable, illustrates superior spelling achievement in a child of inferior reading achievement.

*Case 14* (Fig. 15).—Theodore is a little boy whose reading scores were satisfactory for his grade but who had serious difficulty with spelling. He was eight years and eleven months of age when examined, with a Stanford-Binet mental age of nine years and four months, I.Q. 104. His reading achievement was high third grade, reading index 0.96. His spelling score was second grade. He wrote the words with extreme difficulty, consuming much more time than is usually required for the test by crossing out, erasing, and puzzling over

the formation of the letters in writing the words and the letter composition of the words. He could, however, easily read words written for him. He showed pronounced emotional tension during the spelling tests.

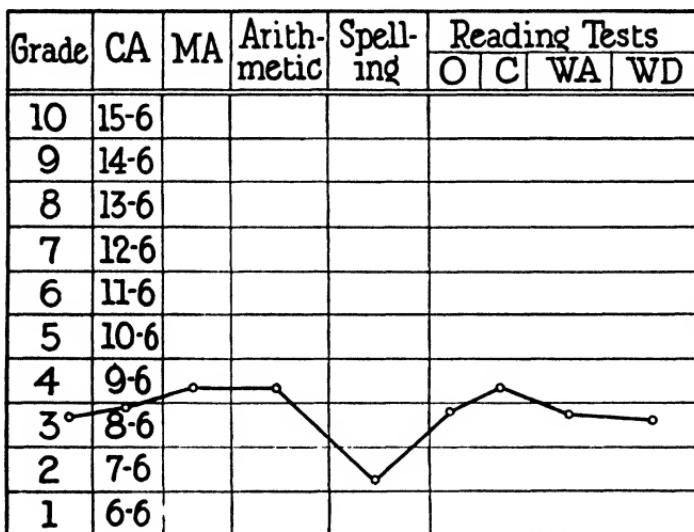


FIG. 15.—Case 14, Theodore. Reading index, 0.96

*Case 15* (Fig. 16).—Clarence is a boy who shows a wide discrepancy between the ability to read silently and the other reading skills. He was thirteen years and nine months of age when examined, with a Stanford-Binet mental age of fifteen years and five months, I.Q. 111. In spite of his many errors in oral reading and in identifying and pronouncing isolated words, he can get the meaning from the text quickly and make a score on the silent-reading test over two grades in advance of his oral-reading test score. His reading is considerably retarded for his chronological and mental ages, his index being 0.66.

*Case 16* (Fig. 17).—Albert's educational profile shows a contour just opposite to that of Clarence in his ability in the various reading skills. Albert can read orally and pronounce isolated words much better than he can read silently for content. He was fourteen years and two months of age when examined, with a Stanford-Binet mental age of eleven years and two months, I.Q. 80. He was seriously retarded in reading, his reading index being 0.66. He had developed a certain amount of mechanical skill in pronouncing words but he did not seem to comprehend the meaning of the text in silent reading.

*Case 17* (Fig. 18).—Stewart is a boy who was fifteen years and eight months of age when examined, with a Stanford-Binet mental age of sixteen years and eleven months, I.Q. 107, reading index 0.58. He showed a marked

discrepancy between his ability to read material presented in paragraph structure and in isolated words. In reading paragraph material, both orally

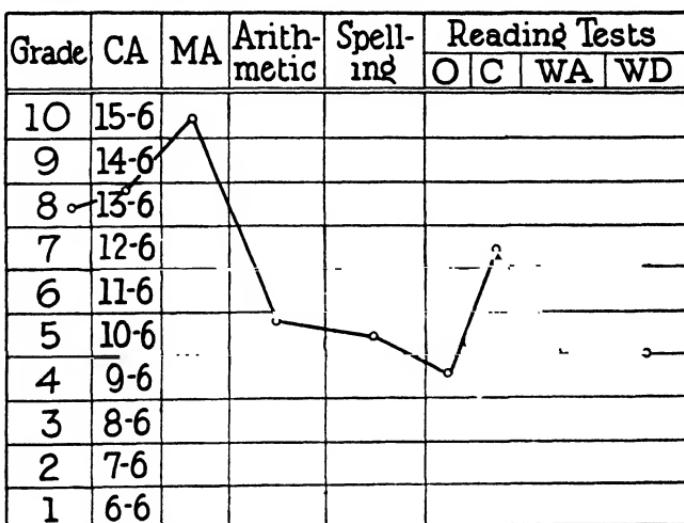


FIG. 16.—Case 15, Clarence. Reading index, 0.66

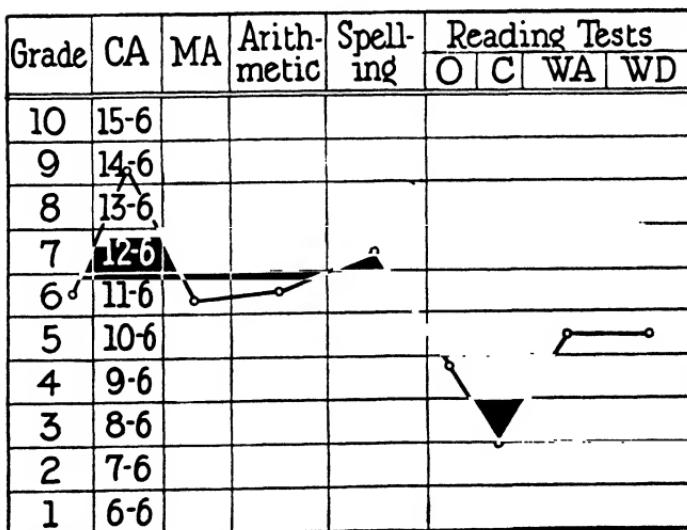


FIG. 17.—Case 16, Albert. Reading index, 0.66

and silently, he scored two grades in advance of his scores on the word tests. He seemed to be able to get clues from the context which enabled him to read

## CHILDREN WHO CANNOT READ

words in the text accurately although he was unable to identify them correctly in isolation.

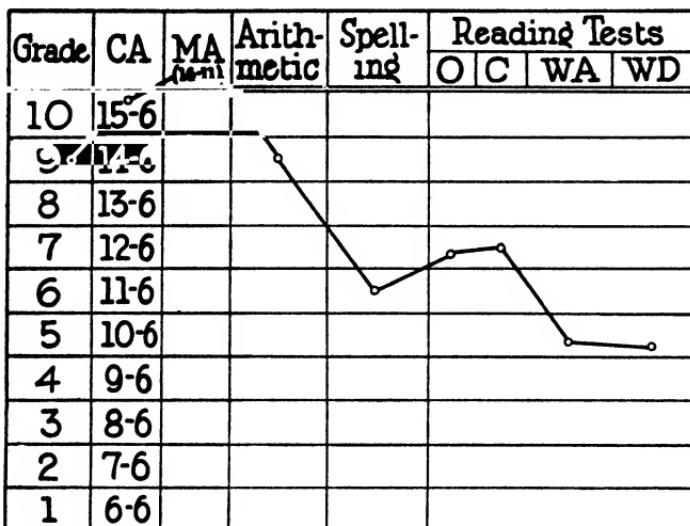


FIG. 18.—Case 17, Stewart. Reading index, 0.58

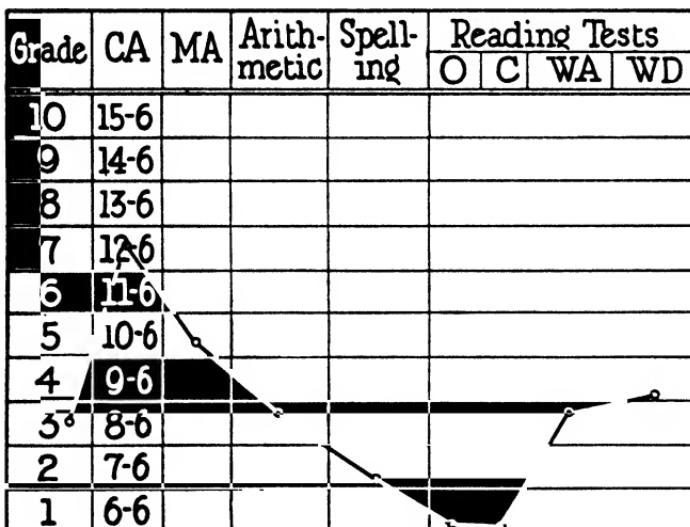


FIG. 19.—Case 18, William. Reading index, 0.50

Case 18 (Fig. 19).—William's educational profile shows a contour in the reading tests just opposite to that of Stewart. William was able to read

isolated words much better than he could read paragraph material. He was twelve years and two months of age when examined, with a mental age of ten years and one month, I.Q. 83, with a reading index of 0.50. His achievements on the word tests were over two years in advance of his achievements in tests in which the material is presented in paragraph structure. He seemed confused by the text, could not keep his place, and guessed wildly at words which were read accurately when removed from the text and presented in isolation.

#### THE USE OF THE EDUCATIONAL PROFILE AND THE READING INDEX IN SELECTION OF CASES

The preceding series of cases illustrates the use of the educational profile and the reading index in selecting children who have specific reading defects. The educational profile assists in understanding the child's problem of maladjustment by indicating the magnitude of the discrepancy or lack of harmony between his accomplishments. It helps to discriminate between the high and low points of his achievements. It does not help directly in understanding the causative factors involved in the defect, although it aids us in selecting points of investigation. It does not assist directly in the selection of remedial methods, although it indicates in some cases discrepancies between the reading skills which offer a point of attack. The reading index sets a goal toward which to work in applying remedial instruction (i.e., to raise the reading index to a point satisfactory for school adjustment) and gives a satisfactory means of measuring the improvement brought about by the corrective work.

## CHAPTER III

### THE QUALITATIVE MEASUREMENT OF READING DEFECTS

If we are to attempt to remove a child's reading defect by teaching him to read, we must not only know the extent of his retardation in reading but also the nature of his difficulties. His errors in reading give an indication of his particular difficulties. All children in learning to read make errors which are gradually eliminated as a part of the natural process of learning. Reading errors are of many kinds and may be classified into various types. Two children, reading the same paragraph, may make the same number of errors, receive the same reading grade, and yet their mistakes may be wholly different in nature. Their reading performances may be quantitatively the same but qualitatively unlike. If we find that a child fails to eliminate a certain type of error so that he makes many more mistakes of that type than other children generally do, at a given stage of reading achievement, we may assume that some factor has interfered with the normal process of learning to read, with regard to eliminating that particular type of error.

#### CLASSIFICATION OF READING ERRORS

The errors made by the group of control children were used as the standard with which to compare the errors of the reading-defect cases. Errors were carefully recorded on three tests: Gray's Oral Reading Examination, the Iota Word Test, and the Word-Discrimination Test (see Appendix for full description of method of tabulating errors). The analysis of errors was made according to the following outline:

*Faulty vowels.*—A vowel error was tabulated for each mispronunciation in which the child altered one or more vowel sounds of the test word.

**EXAMPLES:** dig *read* dug  
 left *read* lift  
 not *read* note  
 care *read* car  
 appear *read* appar  
 blind *read* blinned

*Faulty consonants.*—A consonant error was tabulated for each mispronunciation in which the child altered one or more consonant sounds of the test word.

**EXAMPLES:** send *read* sent  
 tack *read* tag  
 sort *read* short  
 this *read* his  
 magnificent *read* magnifikent

*Reversals.*—A reversal was tabulated for each mispronunciation in which the child reversed the orientation of letters, the sequence of letters, or the sequence of words.

**EXAMPLES:** Reversed orientation of letters:  
 b, d, p, q, u, n interchanged  
 dig *read* big  
 squirt *read* spirit  
 bone *read* done  
 contemptuous *read* contemptnous  
 Reversed sequence of letters:  
 was *read* saw  
 on *read* no  
 left *read* felt  
 card *read* crad  
 Reversed sequence of words:  
*Text:* "Mother," he said.  
*Read:* "Mother," said he.  
*Text:* Once there was \_\_\_\_\_.  
*Read:* There once was \_\_\_\_\_.

*Addition of sounds.*—A sound-addition was tabulated for each mispronunciation in which the child inserted one or more sounds.

**EXAMPLES:** tack *read* track  
 sung *read* swung  
 pod *read* pond  
 one *read* once  
 puss *read* pussie  
 till *read* until

*Omission of sounds.*—A sound-omission was tabulated for each mispronunciation in which the child omitted one or more sounds of the test word.

EXAMPLES: farming *read* farm

Carl *read* car

repast *read* rast

blind *read* bind

habitually *read* habitly

*Substitution of words.*—A substitution was tabulated for each mispronunciation in which the child substituted a word having no consonant or vowel sounds similar to the test word and not related to the test word by reversed letters or sequence, or mistaken choice of possible vowel or consonant sounds.

EXAMPLES: lived *read* was

of *read* by

were *read* had

puss *read* kitty

the *read* and

*Repetition of words.*—A repetition was tabulated each time the child repeated one of the test words or repeated his mispronunciation of the test word.

EXAMPLES: *Text:* A boy had a dog.

*Read:* A boy a boy had a dog a dog.

[Counted as four repetitions.]

*Text:* Once there lived a king and a queen.

*Read:* One one once there lived there lived a king and a a queen.

[Counted as four repetitions. A correction was not counted as a repetition.]

*Addition of words.*—A word-addition was tabulated for each word the child inserted into the text.

EXAMPLES: *Text:* Once there was \_\_\_\_\_.

*Read:* Once upon a time there was \_\_\_\_\_.

[Counted as three word-additions.]

*Text:* \_\_\_\_\_ saw his four feet.

*Read:* \_\_\_\_\_ saw his four little feet.

[Counted as one word-addition.]

*Omission of words.*—A word-omission was tabulated for each word the child omitted from the text.

**EXAMPLES:** *Text:* \_\_\_\_\_ a little pig.

*Read:* \_\_\_\_\_ a pig.

[Counted as one word-omission.]

*Text:* Then the boy began to cry.

*Read:* The boy began crying.

[Counted as two word-omissions.]

*Refusals and words aided.*—A refusal or aided word was tabulated for each word which the child refused to attempt or over which he hesitated so long (for fifteen seconds in our procedure in giving Gray's Oral Reading Paragraphs) that the word was pronounced for him.

**EXAMPLE:** *Text:* One of the most interesting \_\_\_\_\_.

*Read:* One of the most \_\_\_\_\_ [child hesitates over word and finally says, "I don't know that word."].

Many errors were found to contain more than one type of mistake (as "tap" read "track," a sound-addition and a consonant error, or "tap" read "trick," a sound-addition, a vowel error, and a consonant error). Such mispronunciations were tabulated once under each type of error.

Mispronunciations due to speech defects, dialect, or foreign accent were not counted as reading errors if they occurred in the child's spontaneous conversation as well as in his reading.

#### THE PROFILE OF ERRORS

The number of errors of each type were counted and summated for the three tests. Each child's record of errors was similar in form to Case 19, p. 38.

An inspection of the records showed that while each child was presented with the same number of words in the Iota Word Test and the Word-Discrimination Test, he might read from one to twelve paragraphs in Gray's Oral Reading Paragraphs. Each child is directed to start with the first paragraph and continues reading, each successive paragraph increasing in difficulty, until he makes at least seven errors in each of two successive paragraphs. For this reason it is possible for a good reader to make more errors than a poor reader; for example, a third-grade reader may make more errors than a second-grade reader since he may

read more paragraphs. This apparent reversal of the normal order of progress disappears if we consider not the raw number of errors made on the test but the proportion of errors to the total number of words read. Thus, a child who makes 60 errors in 200 words makes fewer errors in proportion than a child who makes 50 errors in 100 words.

In order to have the same basis of comparison for all children regardless of the number of paragraphs read, we worked out a

CASE 19: BILLY (CONTROL GROUP)

NUMBER OF ERRORS

(Reading index, 1.00; average reading grade, 3.3)

Error-Type	Gray's Oral Reading Para- graphs (Read 7 Paragraphs, 384 Words)	Iota Word Test (53 Words)	Word-Discrimi- nation Test (47 Words)	Raw Profile of Errors Total
Vowels.....	8	10	4	22
Consonants.....	8	6	4	18
Reversals.....	0	2	3	5
Addition of sounds.....	5	4	4	13
Omission of sounds.....	8	4	0	12
Substitution.....	1	0	0	1
Repetition.....	5	0	0	5
Addition of words.....	1	0	0	1
Omission of words.....	1	0	0	1
Refusals and aid.....	7	0	0	7
Total.....	44	26	15	85

table whereby we could translate the child's raw errors into the proportion of errors per 500 words. Five hundred was chosen for the standard number of words because it was the nearest round number to the actual number of words read by the median child of the control group (537). Thus, in the case of Billy, who made 85 errors on the three tests, reading a total of 484 words, the proportionate score for 500 words would be 87 errors. In the case of another child who made 85 errors in reading 590 words, the proportionate score for 500 words would be 72 errors.

The calculation of the proportionate error scores was simplified by the preparation of Table VIII, whereby each child's raw profile

## QUALITATIVE MEASUREMENT

39

TABLE VIII\*

CONVERSION OF RAW ERRORS OF THE PROFILE OF ERRORS TO  
 PROPORTIONATE SCORES FOR 500 WORDS READ  
 No of Paragraphs Read in Gray's Oral Reading Paragraphs

RAW ERROR SCORE	1	2	3	4	5	6	7	8	9	10	11	12
	Proportionate Error Score											
I....	3	3	2	2	1	1	1	1	1	1	1	1
2....	7	5	4	3	3	2	2	2	2	2	1	1
3....	10	8	6	5	4	3	3	3	3	2	2	2
4....	14	10	8	6	5	5	4	4	3	3	3	3
5....	17	13	10	8	7	6	5	5	4	4	4	3
6....	20	15	12	10	8	7	6	6	5	5	4	4
7....	24	18	14	11	10	8	7	7	6	6	5	5
8....	27	20	16	13	11	9	8	7	7	6	6	6
9....	30	23	18	14	12	10	9	8	8	7	7	6
10....	34	25	20	16	14	12	10	9	8	8	7	7
II....	37	28	22	18	15	13	11	10	9	9	8	8
12....	41	31	24	19	16	14	12	11	10	9	9	8
13....	44	33	26	21	18	15	13	12	11	10	10	9
14....	47	36	29	22	19	16	14	13	12	11	10	10
15....	51	38	31	24	20	17	16	14	13	12	11	10
16....	54	41	33	26	22	19	17	15	14	13	12	11
17....	57	43	35	27	23	20	18	16	14	13	12	12
18....	61	46	37	29	24	21	19	17	15	14	13	12
19....	64	48	39	30	26	22	20	18	16	15	14	13
20....	68	51	41	32	27	23	21	19	17	16	15	14
21....	71	53	43	34	29	24	22	20	18	17	15	15
22....	74	56	45	35	30	26	23	20	19	17	16	15
23....	78	58	47	37	31	27	24	21	19	18	17	16
24....	81	61	49	39	33	28	25	22	20	19	18	17
25....	84	64	51	40	34	29	26	23	21	20	18	17
26....	88	66	53	42	35	30	27	24	22	20	19	18
27....	91	69	55	43	37	31	28	25	23	21	20	19
28....	95	71	57	45	38	32	29	26	24	22	20	19
29....	98	74	59	47	39	34	30	27	25	23	21	20
30....	101	76	61	48	41	35	31	28	25	24	22	21
31....	105	79	63	50	42	36	32	29	26	24	23	22
32....	108	81	65	51	43	37	33	30	27	25	23	22
33....	111	84	67	53	45	38	34	31	28	26	24	23
34....	115	86	69	55	46	39	35	32	29	27	25	24
35....	118	89	71	56	47	41	36	33	30	28	26	24
36....	122	91	73	58	49	42	37	34	30	28	26	25
37....	125	94	75	59	50	43	38	34	31	29	27	26
38....	128	96	77	61	52	44	39	35	32	30	28	26
39....	132	99	79	63	53	45	40	36	33	31	29	27
40....	135	102	81	64	54	46	41	37	34	31	29	28

TABLE VIII\*—Continued

RAW ERROR SCORE	1	2	3	4	5	6	7	8	9	10	11	12
	Proportionate Error Score											
41.....	138	104	83	66	56	48	42	38	35	32	30	28
42.....	142	107	85	67	57	49	43	39	36	33	31	29
43.....	145	109	87	69	58	50	44	40	36	34	31	30
44.....	149	112	90	71	60	51	45	41	37	35	32	31
45.....	152	114	92	72	61	52	46	42	38	35	33	31
46.....	155	117	94	74	62	53	47	43	39	36	34	32
47.....	158	119	96	75	64	55	49	44	40	37	34	33
48.....	162	122	98	77	65	56	50	45	41	38	35	33
49.....	165	124	100	79	66	57	51	46	42	39	36	34
50.....	169	127	102	80	68	58	52	46	42	39	37	35
51.....	172	129	104	82	69	59	53	47	43	40	37	35
52.....	176	132	106	83	70	60	54	48	44	41	38	36
53.....	179	135	108	85	72	61	55	49	45	42	39	37
54.....	182	137	110	87	73	63	56	50	46	42	40	37
55.....	186	140	112	88	75	64	57	51	47	43	40	38
56.....	189	142	114	90	76	65	58	52	47	44	41	39
57.....	192	145	116	91	77	66	59	53	48	45	42	40
58.....	196	147	118	93	79	67	60	54	49	46	42	40
59.....	199	150	120	95	80	68	61	55	50	46	43	41
60.....	203	152	122	96	81	70	62	56	51	47	44	42
61.....	206	155	124	98	83	71	63	57	52	48	45	42
62.....	209	157	126	100	84	72	64	58	53	49	45	43
63.....	213	160	128	101	85	73	65	59	53	50	46	44
64.....	216	162	130	103	87	74	66	60	54	50	47	44
65.....	219	165	132	104	88	75	67	60	55	51	48	45
66.....	223	168	134	106	89	77	68	61	56	52	48	46
67.....	226	170	136	108	91	78	69	62	57	53	49	46
68.....	230	173	138	109	92	79	70	63	58	53	50	47
69.....	233	175	140	111	94	80	71	64	58	54	51	48
70.....	236	177	142	112	95	81	72	65	59	55	51	49
71.....	240	180	144	114	96	82	73	66	60	56	52	50
72.....	243	182	146	116	98	84	74	67	61	57	53	50
73.....	246	185	148	117	99	85	75	68	62	57	53	51
74.....	250	188	150	119	100	86	76	69	63	58	54	51
75.....	253	190	153	120	102	87	77	70	64	59	55	52
76.....	257	193	155	122	103	88	79	71	64	60	56	53
77.....	260	195	157	124	104	89	80	72	65	61	56	53
78.....	263	198	159	125	106	90	81	72	66	61	57	54
79.....	267	201	161	127	107	92	82	73	67	62	58	55
80.....	270	203	163	128	108	93	83	74	68	63	59	56
K.....	3.375	2.538	2.033	1.605	1.355	1.160	1.033	0.929	0.847	0.786	0.732	0.694

\* Proportionate score per 500 words = Raw score  $\times$  K.

of errors could be quickly converted into proportionate scores for 500 words. Referring again to Billy's case, and using column 7

of the table to correspond to the number of paragraphs read in Gray's Oral Reading Paragraphs, we converted Billy's raw error scores to proportionate scores as tabulated.

Error-Type	Raw Profile of Errors	Proportionate Error Score for 500 Words; Corrected Profile of Errors
Vowels.....	22	23
Consonants.....	18	19
Reversals.....	5	5
Addition of sounds.....	13	13
Omission of sounds.....	12	12
Substitution.....	1	1
Repetition.....	5	5
Addition of words.....	1	1
Omission of words.....	1	1
Refusals and aid.....	7	7
Total.....	85	87

Decimals were dropped, correcting the number to the nearest unit.

The corrected profile of errors for each child consisted of the number of errors of each type multiplied by a constant to give the number of errors as for 500 words instead of as for the number of words actually read. The assumption is made that a child maintains the same ratio of error-types in 500 words as he does in the number of words actually read.

#### RELIABILITY OF READING ERRORS

That a child is inclined to maintain the same profile of errors is shown by the reliability coefficients for the different error-types. Fifty children were retested within a period of from three to six months after the original test. The reliability coefficients of the error-types are tabulated as shown on page 42 (Pearson  $r$ , errors in Test 1, correlated with errors in Test 2, proportionate error scores per 500 words used in each case).

The children tended to be very reliable in their errors in vowels, consonants, reversals, addition of sounds, refusals and words aided, and total errors, as shown by reliability coefficients above .90.

A child who fails to discriminate between vowel and consonant sounds, reverses orientation or sequence of letters and words, inserts extra sounds in words, and "blocks" over words or refuses to attempt them tends to repeat the same performance at a later examination even though several months have intervened between the tests. Substitution of words, omission of sounds, and repetition are less reliable errors than are the foregoing series, although the reliability coefficients of .76 to .82 are high enough to give a good indication of the tendency to make these types of errors. Addition and omission of words are the least reliable of the error-types with reliability coefficients of .55 and .60. The difference

Error-Type	Reliability Coefficient
Vowels.....	.94±.009
Consonants.....	.91±.016
Reversals.....	.93±.013
Addition of sounds.....	.91±.015
Omission of sounds.....	.77±.038
Substitution.....	.82±.030
Repetition.....	.76±.039
Addition of words.....	.55±.071
Omission of words.....	.60±.061
Refusals and words aided.....	.95±.009
Total errors.....	.97±.004

between the reliabilities of the various error-types may be due partly to the fact that some of the error-types are more frequent than others among all children, so that a larger sampling (or more items) is obtained in 500 words. The order of frequency of errors is not exactly the same as that of the reliabilities, however, so the difference would not be wholly explained by this fact. It is probable that the tendency to certain error-types is persistent within the child and appears whenever he attempts to read, while the tendency to other error-types may be influenced by temporary "set" or "attitude" and appear on one occasion more frequently than on another. For example, the "set" to skim or read rapidly may increase the omissions of sounds and omission of words, while the "set" to read slowly and carefully may reduce them. Had the tests been repeated at an earlier date, say a week after the first

test, instead of three to six months later, the reliability coefficients of many of the error-types would probably have been higher.

#### STANDARDIZATION OF READING ERRORS

The means and the standard deviations of each error-type were calculated for each reading grade. Smoothed curves were drawn

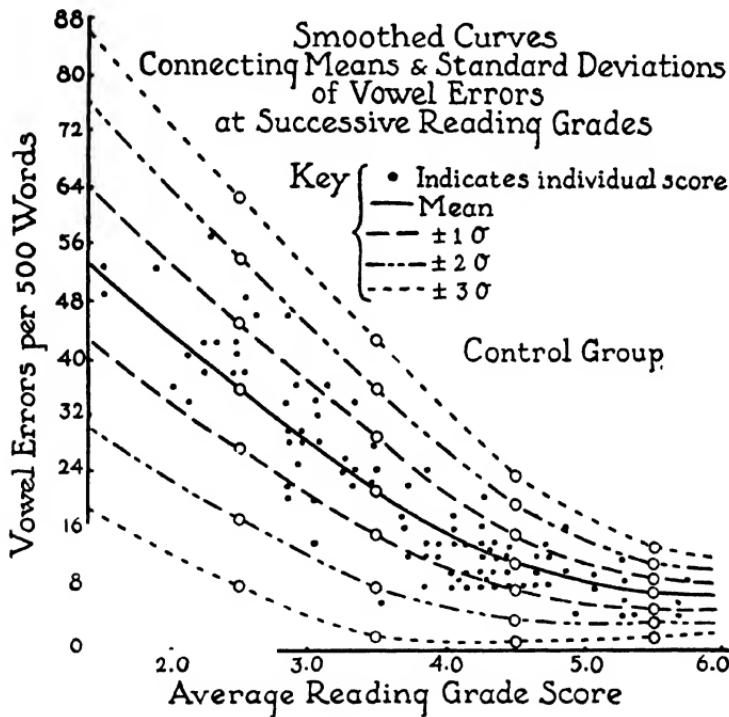


FIG. 20

between the means and standard deviations for each successive grade. The chart for "vowels" is given in Figure 20 to show the method which was used for all error-types. The smoothed curves were continued slightly beyond the limits of the data at each end in accordance with the observed trends.

Values for each tenth-grade were read from the curves and are given in Tables IX to XIX. By the use of these tables the number of errors of any error-type made by a child can be com-

## CHILDREN WHO CANNOT READ

TABLE IX

## VOWELS

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	19	30	41	53	64	75	86	97	108
1.5.....	18	29	40	51	62	73	84	95	106
1.6.....	17	28	39	50	61	72	83	93	104
1.7.....	16	27	37	47	58	69	80	90	101
1.8.....	15	26	36	46	57	67	78	88	99
1.9.....	14	24	34	45	55	66	76	86	97
2.0.....	13	23	33	43	53	64	74	84	94
2.1.....	12	22	32	42	51	62	72	82	91
2.2.....	11	21	31	41	50	60	70	80	90
2.3.....	11	21	30	40	49	58	68	78	87
2.4.....	10	20	29	38	47	57	66	76	85
2.5.....	10	19	28	37	46	55	64	73	82
2.6.....	9	18	27	35	44	53	62	71	80
2.7.....	8	17	26	34	43	51	60	69	78
2.8.....	7	16	24	32	41	49	58	67	75
2.9.....	6	15	23	31	39	47	56	64	72
3.0.....	5	14	22	30	38	46	54	62	70
3.1.....	5	13	20	28	36	44	52	60	68
3.2.....	4	12	19	27	34	42	50	58	65
3.3.....	3	11	18	25	33	40	48	56	63
3.4.....	3	10	17	24	31	38	46	53	60
3.5.....	2	9	16	23	30	37	44	51	58
3.6.....	2	8	15	21	28	35	42	48	54
3.7.....	2	8	14	20	26	33	40	46	52
3.8.....	1	7	13	19	25	31	38	44	50
3.9.....	1	7	12	18	24	29	35	41	47
4.0.....	1	6	11	17	22	27	33	39	45
4.1.....	1	6	11	16	21	26	31	36	41
4.2.....	1	5	10	14	19	24	29	34	39
4.3.....	1	5	9	13	18	23	28	32	37
4.4.....	1	5	9	12	17	22	26	30	34
4.5.....	1	4	8	12	16	20	24	28	32
4.6.....	1	4	8	11	15	19	23	26	30
4.7.....	1	4	7	11	15	18	21	25	28
4.8.....	1	4	7	10	14	17	20	23	27
4.9.....	1	4	7	10	13	16	19	22	25
5.0.....	1	4	7	10	13	15	18	21	23
5.1.....	1	4	7	9	12	15	17	20	22
5.2.....	1	4	7	9	12	14	16	19	21
5.3.....	1	4	6	8	11	13	15	18	20
5.4.....	1	4	6	8	10	13	15	17	19
5.5.....	2	4	6	8	10	12	14	16	18
5.6.....	2	4	6	8	10	12	14	16	18
5.7.....	2	3	5	7	9	11	13	15	17
5.8.....	2	2	5	7	10	11	13	15	17

TABLE X\*  
CONSONANTS

AVERAGE READING GRADE SCORE	X-SCORES									
	-3	-2	-1	0	+1	+2	+3	+4	+5	
1.4.....	3	13	23	33	44	54	64	74	84	
1.5.....	2	12	22	32	42	52	62	72	82	
1.6.....	2	11	21	31	41	50	60	70	80	
1.7.....	1	10	20	29	39	49	59	68	78	
1.8.....	1	9	19	28	38	47	57	66	76	
1.9.....	0	9	18	27	37	46	55	64	74	
2.0.....	0	8	17	26	35	44	53	62	71	
2.1.....	0	7	16	25	34	43	51	60	69	
2.2.....	0	7	16	24	33	41	50	59	68	
2.3.....	0	6	15	23	32	40	48	57	66	
2.4.....	0	6	14	22	30	38	46	55	63	
2.5.....	0	5	13	21	29	37	45	53	61	
2.6.....	0	5	13	20	28	36	43	51	58	
2.7.....	0	4	12	19	27	34	41	49	56	
2.8.....	0	4	11	18	26	33	40	47	54	
2.9.....	0	4	11	17	25	31	38	45	51	
3.0.....	0	3	10	17	24	30	36	43	50	
3.1.....	0	3	10	16	23	29	34	41	47	
3.2.....	0	3	9	15	22	27	33	39	44	
3.3.....	0	3	9	14	20	26	31	37	42	
3.4.....	0	3	8	14	19	25	30	35	40	
3.5.....	0	3	8	13	18	23	28	33	38	
3.6.....	0	3	7	12	17	22	27	31	36	
3.7.....	0	2	7	12	16	21	26	30	35	
3.8.....	0	2	6	11	15	20	24	28	33	
3.9.....	0	2	6	10	15	19	23	27	31	
4.0.....	0	2	6	10	14	18	22	26	30	
4.1.....	0	2	5	9	13	17	21	24	28	
4.2.....	0	2	5	8	12	16	19	23	26	
4.3.....	0	2	5	8	12	15	18	21	25	
4.4.....	0	2	5	8	11	14	17	20	23	
4.5.....	0	2	4	7	10	13	16	19	22	
4.6.....	0	1	4	7	10	13	15	18	21	
4.7.....	0	1	4	6	9	12	15	18	20	
4.8.....	0	1	4	6	9	12	14	17	20	
4.9.....	0	1	4	6	9	11	14	17	19	
5.0.....	0	1	4	6	9	11	13	16	19	
5.1.....	0	1	4	6	9	11	13	16	18	
5.2.....	0	1	4	6	9	11	13	16	18	
5.3.....	0	1	3	6	8	11	13	16	18	
5.4.....	0	1	3	6	8	11	13	15	18	
5.5.....	0	0	2	6	8	11	13	15	18	
5.6.....	0	0	2	6	8	11	13	15	17	
5.7.....	0	0	2	5	7	10	12	15	17	
5.8.....	0	0	2	5	7	10	12	15	17	

\* Let  $o = -2.22$  (from 5.5 to 5.8).

TABLE XI  
REVERSALS

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	10	18	26	34	42	50	58	66	74
1.5.....	9	17	25	33	41	49	57	65	73
1.6.....	8	16	24	32	40	48	56	63	71
1.7.....	8	16	24	31	39	46	54	62	69
1.8.....	8	15	23	30	37	45	52	60	67
1.9.....	7	15	22	29	36	43	50	58	65
2.0.....	7	14	21	28	35	42	49	56	63
2.1.....	6	13	20	27	34	41	47	54	61
2.2.....	6	13	19	26	33	39	46	52	59
2.3.....	5	12	18	25	31	38	44	51	57
2.4.....	5	11	17	24	32	36	42	49	55
2.5.....	5	11	17	23	29	35	41	47	53
2.6.....	4	10	16	22	27	34	39	45	51
2.7.....	4	10	15	21	26	32	38	43	49
2.8.....	3	9	14	20	24	30	36	41	46
2.9.....	3	8	13	19	23	29	34	39	44
3.0.....	2	8	12	18	22	27	31	37	42
3.1.....	2	7	11	16	21	26	30	35	40
3.2.....	2	6	11	15	20	25	29	33	38
3.3.....	1	6	10	14	19	23	28	32	36
3.4.....	1	5	9	13	17	21	26	30	34
3.5.....	1	4	8	12	16	20	24	28	32
3.6.....	1	4	8	11	15	19	23	27	31
3.7.....	1	4	7	10	15	19	23	26	30
3.8.....	0	3	7	9	14	18	22	25	29
3.9.....	0	3	6	9	13	17	21	24	28
4.0.....	0	2	6	9	13	16	20	24	27
4.1.....	0	2	5	9	12	16	19	23	26
4.2.....	0	2	5	8	11	15	18	22	25
4.3.....	0	2	5	8	11	14	18	21	24
4.4.....	0	2	4	7	10	13	17	20	23
4.5.....	0	1	4	7	10	13	16	19	22
4.6.....	0	1	4	7	10	12	15	18	21
4.7.....	0	1	4	7	9	12	15	18	20
4.8.....	0	1	4	6	9	12	14	17	19
4.9.....	0	1	3	6	9	12	14	17	19
5.0.....	0	1	3	6	8	10	13	16	18
5.1.....	0	1	3	6	8	10	13	16	18
5.2.....	0	1	3	6	8	10	13	15	18
5.3.....	0	1	3	6	8	10	13	15	17
5.4.....	0	1	3	6	8	10	13	15	17
5.5.....	0	1	3	6	8	10	12	14	16
5.6.....	0	1	3	5	7	9	12	14	16
5.7.....	0	1	3	5	7	9	11	13	15
5.8.....	0	1	3	5	7	9	11	13	15

TABLE XII\*  
ADDITION OF SOUNDS

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	14	20	26	32	38	44	50	56	62
1.5.....	13	19	25	31	37	43	49	55	61
1.6.....	12	18	24	30	36	42	48	54	60
1.7.....	11	17	23	29	35	41	47	53	59
1.8.....	10	16	22	28	34	40	46	52	58
1.9.....	9	15	21	27	33	39	45	51	57
2.0.....	8	14	20	26	32	38	44	50	56
2.1.....	6	12	18	24	30	36	42	48	54
2.2.....	5	11	17	23	29	35	41	47	53
2.3.....	4	10	16	22	28	34	40	46	52
2.4.....	3	9	15	21	27	33	39	45	51
2.5.....	2	8	14	20	26	32	38	44	50
2.6.....	1	7	13	19	25	31	37	43	49
2.7.....	1	7	12	18	24	29	35	40	46
2.8.....	1	6	11	17	23	28	34	39	45
2.9.....	0	5	11	16	22	27	32	37	43
3.0.....	0	5	10	16	21	26	31	36	41
3.1.....	0	5	10	15	20	25	30	35	40
3.2.....	0	4	9	14	19	24	29	34	39
3.3.....	0	4	9	13	18	22	27	31	36
3.4.....	0	4	8	13	17	21	26	30	35
3.5.....	0	3	7	11	15	19	23	27	32
3.6.....	0	2	6	10	14	18	22	26	31
3.7.....	0	1	5	9	13	17	21	25	30
3.8.....	0	0	4	8	12	16	20	24	29
3.9.....	0	0	4	8	12	16	20	24	28
4.0.....	0	0	3	7	11	15	19	23	27
4.1.....	0	0	3	7	11	15	19	23	26
4.2.....	0	0	2	6	10	14	18	22	25
4.3.....	0	0	2	6	10	13	17	20	24
4.4.....	0	0	2	5	9	12	16	19	23
4.5.....	0	0	2	5	8	11	14	17	22
4.6.....	0	0	2	5	8	11	14	17	21
4.7.....	0	0	2	5	8	11	14	17	20
4.8.....	0	0	1	4	7	10	13	16	19
4.9.....	0	0	1	4	7	10	13	16	19
5.0.....	0	0	1	4	7	10	13	16	19
5.1.....	0	0	1	4	7	10	13	16	19
5.2.....	0	0	1	4	7	10	13	16	19
5.3.....	0	0	1	4	7	10	13	16	18
5.4.....	0	0	1	4	7	10	13	16	17
5.5.....	0	0	1	4	7	9	11	14	16
5.6.....	0	0	1	4	6	8	10	13	15
5.7.....	0	0	1	3	5	7	9	12	14
5.8.....	0	0	1	3	5	7	9	11	13

\* Let  $\sigma = -2.22$  (from 3.8 to 5.8).

## CHILDREN WHO CANNOT READ

TABLE XIII

## OMISSION OF SOUNDS

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	0	4	10	16	22	28	34	40	46
1.5.....	0	4	10	16	22	28	34	40	46
1.6.....	0	4	10	16	21	27	33	39	45
1.7.....	0	4	10	16	21	27	33	39	45
1.8.....	0	4	10	15	21	27	32	38	44
1.9.....	0	4	10	15	20	26	31	37	43
2.0.....	0	4	10	15	20	25	30	35	40
2.1.....	0	4	10	15	20	25	30	35	40
2.2.....	0	4	10	15	20	25	30	35	40
2.3.....	0	4	9	14	19	24	29	34	39
2.4.....	0	4	9	14	19	24	29	34	39
2.5.....	0	4	9	14	19	24	29	34	39
2.6.....	0	4	9	14	19	24	29	34	39
2.7.....	0	3	8	14	19	24	29	34	39
2.8.....	0	3	8	13	18	23	28	33	38
2.9.....	0	3	8	13	18	23	28	33	38
3.0.....	0	3	8	13	18	23	28	33	38
3.1.....	0	3	8	13	18	23	28	33	38
3.2.....	0	2	7	13	18	23	28	33	38
3.3.....	0	2	7	12	17	22	27	32	37
3.4.....	0	2	7	12	17	22	27	32	37
3.5.....	0	2	7	12	17	22	27	32	36
3.6.....	0	2	7	12	17	22	27	31	35
3.7.....	0	2	7	12	16	21	26	30	34
3.8.....	0	2	7	11	16	20	25	29	33
3.9.....	0	2	7	11	15	19	24	28	32
4.0.....	0	3	7	11	15	19	23	27	31
4.1.....	0	3	7	11	15	19	23	26	30
4.2.....	0	3	7	11	14	18	22	25	29
4.3.....	0	3	7	10	13	17	21	24	28
4.4.....	0	3	7	10	13	16	20	23	27
4.5.....	1	4	7	10	13	16	19	22	25
4.6.....	1	4	7	10	12	15	18	21	24
4.7.....	1	4	7	10	12	15	18	20	23
4.8.....	1	4	7	9	12	14	17	19	22
4.9.....	1	4	7	9	11	13	16	18	21
5.0.....	2	4	7	9	11	13	15	17	19
5.1.....	2	4	7	9	11	13	15	17	19
5.2.....	2	4	6	9	10	12	14	16	18
5.3.....	2	4	6	8	10	12	14	16	18
5.4.....	2	4	6	8	10	12	13	15	17
5.5.....	3	4	6	8	9	11	13	14	16
5.6.....	3	4	6	8	9	11	13	14	16
5.7.....	3	4	6	8	9	11	13	14	16
5.8.....	3	4	6	8	9	11	13	14	16

TABLE XIV\*  
SUBSTITUTION

AVERAGE READING GRADE SCORE	z-SCORES									
	-3	-2	-1	0	+1	+2	+3	+4	+5	
1.4.....	0	0	2	7	11	16	20	25	29	
1.5.....	0	0	2	7	11	16	20	25	29	
1.6.....	0	0	1	6	10	15	19	24	28	
1.7.....	0	0	1	6	10	15	19	24	28	
1.8.....	0	0	1	6	10	15	19	24	28	
1.9.....	0	0	0	5	9	14	18	24	28	
2.0.....	0	0	0	5	9	14	18	23	27	
2.1.....	0	0	0	5	9	14	18	23	27	
2.2.....	0	0	0	5	9	14	18	22	26	
2.3.....	0	0	0	4	8	13	17	21	25	
2.4.....	0	0	0	4	8	12	16	20	24	
2.5.....	0	0	0	4	8	12	16	20	24	
2.6.....	0	0	0	4	8	12	16	20	24	
2.7.....	0	0	0	4	8	12	16	20	24	
2.8.....	0	0	0	3	7	11	15	19	23	
2.9.....	0	0	0	3	7	11	15	19	22	
3.0.....	0	0	0	3	6	11	14	18	21	
3.1.....	0	0	0	3	6	10	13	17	20	
3.2.....	0	0	0	2	5	9	12	16	19	
3.3.....	0	0	0	2	5	8	11	15	18	
3.4.....	0	0	0	2	5	8	11	14	17	
3.5.....	0	0	0	2	5	8	11	14	17	
3.6.....	0	0	0	2	5	8	11	14	17	
3.7.....	0	0	0	2	5	8	11	14	17	
3.8.....	0	0	0	2	5	8	11	14	17	
3.9.....	0	0	0	2	5	8	11	14	17	
4.0.....	0	0	0	2	5	8	11	14	17	
4.1.....	0	0	0	2	5	8	11	14	17	
4.2.....	0	0	0	2	5	8	11	14	17	
4.3.....	0	0	0	2	5	8	11	14	17	
4.4.....	0	0	0	2	5	8	11	14	16	
4.5.....	0	0	0	1	4	7	10	13	15	
4.6.....	0	0	0	1	4	7	10	12	14	
4.7.....	0	0	0	1	4	6	9	11	13	
4.8.....	0	0	0	1	4	6	8	10	12	
4.9.....	0	0	0	1	3	5	7	9	11	
5.0.....	0	0	0	1	3	5	7	9	11	
5.1.....	0	0	0	1	3	5	7	9	11	
5.2.....	0	0	0	1	3	5	7	9	11	
5.3.....	0	0	0	1	3	5	7	9	11	
5.4.....	0	0	0	1	3	5	7	9	11	
5.5.....	0	0	0	1	3	4	6	8	9	
5.6.....	0	0	0	1	3	4	5	7	8	
5.7.....	0	0	0	1	2	3	4	6	7	
5.8.....	0	0	0	1	2	3	4	5	6	

\* Let  $o = -2.22$  (from 1.4 to 1.8);  $o = -1.42$  (from 1.9 to 5.8).

TABLE XV\*  
REPETITION

AVERAGE READING GRADE SCORE	z-SCORES (STANDARD DEVIATION SCALE)								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	0	4	13	22	31	40	49	58	67
1.5.....	0	3	12	21	30	39	48	57	66
1.6.....	0	2	11	20	29	38	47	55	65
1.7.....	0	2	11	19	28	37	46	54	64
1.8.....	0	1	10	18	28	36	45	53	63
1.9.....	0	1	9	17	27	35	44	52	61
2.0.....	0	0	8	16	25	34	42	50	59
2.1.....	0	0	7	16	25	33	41	49	58
2.2.....	0	0	7	15	24	32	40	48	57
2.3.....	0	0	6	15	23	31	39	47	56
2.4.....	0	0	5	14	22	30	38	46	54
2.5.....	0	0	5	13	21	29	37	45	53
2.6.....	0	0	4	13	21	28	36	44	51
2.7.....	0	0	4	12	20	27	35	42	50
2.8.....	0	0	4	12	19	27	34	41	48
2.9.....	0	0	4	11	18	26	33	40	46
3.0.....	0	0	3	11	18	25	32	39	45
3.1.....	0	0	3	10	17	24	31	37	44
3.2.....	0	0	3	10	17	23	30	36	43
3.3.....	0	0	3	10	16	23	29	35	42
3.4.....	0	0	3	9	16	22	28	34	40
3.5.....	0	0	3	9	15	21	27	33	39
3.6.....	0	0	3	9	15	21	26	32	38
3.7.....	0	0	2	8	14	20	26	31	37
3.8.....	0	0	2	8	14	20	25	31	36
3.9.....	0	0	2	8	13	19	25	30	36
4.0.....	0	0	2	8	13	19	24	29	35
4.1.....	0	0	2	7	13	18	24	29	34
4.2.....	0	0	2	7	12	18	23	28	33
4.3.....	0	0	1	7	12	17	22	27	32
4.4.....	0	0	1	6	12	17	22	27	31
4.5.....	0	0	1	6	11	16	21	26	31
4.6.....	0	0	1	6	11	15	20	25	30
4.7.....	0	0	1	6	10	15	20	24	29
4.8.....	0	0	1	5	10	14	19	23	28
4.9.....	0	0	0	5	9	13	18	23	27
5.0.....	0	0	0	5	9	13	18	22	27
5.1.....	0	0	0	5	9	13	18	22	26
5.2.....	0	0	0	4	8	12	17	21	26
5.3.....	0	0	0	4	8	12	17	21	25
5.4.....	0	0	0	4	8	12	16	20	24
5.5.....	0	0	0	4	8	12	16	20	24
5.6.....	0	0	0	4	8	12	16	20	24
5.7.....	0	0	0	4	8	12	16	20	24
5.8.....	0	0	0	4	8	12	16	20	24

\* Let  $\sigma = -2.22$  (from 2.0 to 4.8);  $\sigma = -1.42$  (from 4.9 to 5.8).

pared with those of the control group, at his own particular grade level of reading. The score in terms of standard deviations

TABLE XVI\*  
ADDITION OF WORDS

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4-1.5.....	0	0	1	4	7	10	13	16	19
1.6-1.7.....	0	0	1	4	7	10	13	16	19
1.8-1.9.....	0	0	1	4	7	10	13	16	19
2.0-2.1.....	0	0	1	4	6	9	12	15	18
2.2-2.3.....	0	0	1	4	6	8	11	14	17
2.4-2.5.....	0	0	1	4	6	8	10	13	16
2.6-2.7.....	0	0	1	3	6	8	10	12	15
2.8-2.9.....	0	0	1	3	6	8	10	12	14
3.0-3.1.....	0	0	1	3	5	7	9	11	13
3.2-3.3.....	0	0	0	3	5	7	9	11	13
3.4-3.5.....	0	0	0	3	5	7	9	11	13
3.6-3.7.....	0	0	0	3	5	7	9	11	13
3.8-3.9.....	0	0	0	3	5	7	9	11	13
4.0-4.1.....	0	0	0	2	4	6	8	10	12
4.2-4.3.....	0	0	0	2	4	6	8	10	12
4.4-4.5.....	0	0	0	2	4	6	8	10	12
4.6-4.7.....	0	0	0	2	4	6	7	9	10
4.8-4.9.....	0	0	0	2	4	5	6	8	9
5.0-5.1.....	0	0	0	2	3	5	6	8	9
5.2-5.3.....	0	0	0	2	3	4	5	7	8
5.4-5.5.....	0	0	0	1	3	4	5	6	7
5.6-5.7.....	0	0	0	1	2	3	4	5	6
5.8-5.9.....	0	0	0	1	2	3	4	5	6

\* Let  $o = -2.22$  (from 1.4 to 3.1);  $o = -1.42$  (from 3.2 to 5.8).

we shall call "z-scores,"<sup>1</sup> as they are obtained from Kelley's formula,

$$z = \frac{X - M}{\sigma},$$

in which  $X$  = An individual's score

$M$  = Mean

$\sigma$  = Standard deviation

$z$  = Standard measure

<sup>1</sup> Truman Kelley, *Statistical Method* (Macmillan, 1923), p. 280.

Each *z*-score gives the child's errors in terms of standard deviations of his reading grade, using his grade score in tenths as the midpoint of the grade distribution. Ideally, we should have calculated standard deviations for the distributions of scores for each tenth-grade, in order to obtain the minimum standard deviation

TABLE XVII\*  
OMISSION OF WORDS

AVERAGE READING GRADE SCORE	z-SCORES									
	-3	-2	-1	0	+1	+2	+3	+4	+5	
1.4-1.5.....	0	0	0	2	5	8	11	14	17	
1.6-1.7.....	0	0	0	2	5	8	11	14	17	
1.8-1.9.....	0	0	0	2	5	8	11	14	17	
2.0-2.1.....	0	0	0	2	5	8	11	14	17	
2.2-2.3.....	0	0	0	2	5	8	11	14	17	
2.4-2.5.....	0	0	0	2	5	8	11	14	17	
2.6-2.7.....	0	0	0	2	5	8	11	14	17	
2.8-2.9.....	0	0	0	2	5	8	11	14	17	
3.0-3.1.....	0	0	0	3	6	9	12	15	18	
3.2-3.3.....	0	0	0	3	6	9	12	15	18	
3.4-3.5.....	0	0	0	3	6	9	12	15	18	
3.6-3.7.....	0	0	0	3	6	10	13	16	19	
3.8-3.9.....	0	0	0	3	7	10	13	17	20	
4.0-4.1.....	0	0	0	4	7	11	14	17	21	
4.2-4.3.....	0	0	0	4	7	11	15	18	22	
4.4-4.5.....	0	0	0	4	8	12	16	19	23	
4.6-4.7.....	0	0	0	4	8	12	16	20	24	
4.8-4.9.....	0	0	0	4	8	12	16	20	24	
5.0-5.1.....	0	0	0	4	8	12	16	20	24	
5.2-5.3.....	0	0	0	4	8	12	16	20	24	
5.4-5.5.....	0	0	0	4	8	12	16	20	24	
5.6-5.7.....	0	0	0	4	8	12	16	20	24	
5.8-5.9.....	0	0	0	4	8	12	16	20	24	

\* Let  $o = -1.42$ .

for the tenth-grade. This we could not do without greatly increasing the number of cases. It is probable, however, that the standard deviations obtained for the whole grades are very nearly the minimum which would have been obtained if grade-tenths had been used, since the correlation between the errors and reading grade which is apparent in the entire distribution had been reduced to nearly zero in the distributions of single grades.

In cases where the errors were reduced to zero at points above

TABLE XVIII\*  
REFUSALS AND WORDS AIDED

AVERAGE READING GRADE SCORE	z-SCORES								
	-3	-2	-1	0	+1	+2	+3	+4	+5
1.4.....	0	4	16	28	40	52	64	76	88
1.5.....	0	1	13	25	37	49	61	73	85
1.6.....	0	0	11	22	33	44	55	66	77
1.7.....	0	0	8	19	30	41	52	63	74
1.8.....	0	0	6	16	26	36	46	56	66
1.9.....	0	0	3	13	23	33	43	55	63
2.0.....	0	0	0	12	21	31	40	50	61
2.1.....	0	0	0	11	20	30	39	49	58
2.2.....	0	0	0	9	18	27	37	46	55
2.3.....	0	0	0	7	16	25	34	43	52
2.4.....	0	0	0	5	14	23	32	41	50
2.5.....	0	0	0	4	13	22	31	40	49
2.6.....	0	0	0	3	12	21	30	39	48
2.7.....	0	0	0	2	11	19	28	36	45
2.8.....	0	0	0	1	9	17	25	34	42
2.9.....	0	0	0	1	9	17	25	33	41
3.0.....	0	0	0	0	7	14	21	28	35
3.1.....	0	0	0	0	7	14	21	27	34
3.2.....	0	0	0	0	7	14	20	26	33
3.3.....	0	0	0	0	6	13	19	25	32
3.4.....	0	0	0	0	6	12	18	24	30
3.5.....	0	0	0	0	5	10	16	21	27
3.6.....	0	0	0	0	5	10	15	20	25
3.7.....	0	0	0	0	5	10	15	19	24
3.8.....	0	0	0	0	5	10	14	18	23
3.9.....	0	0	0	0	5	9	13	17	22
4.0.....	0	0	0	0	4	8	12	16	20
4.1.....	0	0	0	0	4	8	12	16	19
4.2.....	0	0	0	0	4	8	12	15	18
4.3.....	0	0	0	0	4	7	11	14	17
4.4.....	0	0	0	0	4	7	10	13	16
4.5.....	0	0	0	0	3	6	9	12	15
4.6.....	0	0	0	0	3	6	9	12	14
4.7.....	0	0	0	0	3	6	9	11	13
4.8.....	0	0	0	0	3	5	8	10	12
4.9.....	0	0	0	0	3	5	7	9	11
5.0.....	0	0	0	0	2	4	6	8	10
5.1.....	0	0	0	0	2	4	6	8	9
5.2.....	0	0	0	0	2	4	6	7	8
5.3.....	0	0	0	0	2	3	5	6	7
5.4.....	0	0	0	0	2	3	4	5	6
5.5.....	0	0	0	0	1	2	3	4	5
5.6.....	0	0	0	0	1	2	3	4	5
5.7.....	0	0	0	0	1	2	3	4	5
5.8.....	0	0	0	0	1	2	3	4	5

\* Let  $o = -2.22$  (from 1.6 to 1.9);  $o = -1.42$  (from 2.0 to 2.9);  $o = -0.62$  (from 3.0 to 5.8).

TABLE XIX  
TOTAL ERRORS

AVERAGE READING GRADE SCORE	z-SCORES									
	-3	-2	-1	0	+1	+2	+3	+4	+5	
1.4.....	142	174	206	238	270	302	334	366	398	
1.5.....	138	169	200	231	262	293	324	355	386	
1.6.....	127	158	189	220	251	282	313	344	375	
1.7.....	120	150	180	210	240	270	300	330	360	
1.8.....	116	145	174	203	232	261	290	319	348	
1.9.....	110	138	166	194	222	250	278	306	334	
2.0.....	104	132	160	188	216	244	272	300	328	
2.1.....	94	122	150	178	206	234	262	290	318	
2.2.....	91	118	145	172	199	226	253	280	307	
2.3.....	86	112	138	164	190	216	242	268	294	
2.4.....	83	108	133	158	183	208	233	258	283	
2.5.....	77	101	125	149	173	197	221	245	269	
2.6.....	71	95	119	143	167	191	215	239	263	
2.7.....	66	88	112	136	160	184	208	232	256	
2.8.....	61	84	107	130	153	176	199	222	245	
2.9.....	55	78	101	124	147	170	193	216	239	
3.0.....	49	72	95	118	141	164	187	210	233	
3.1.....	47	69	91	113	135	157	179	201	223	
3.2.....	42	64	86	108	130	152	174	196	218	
3.3.....	40	61	82	103	124	145	166	187	208	
3.4.....	35	56	77	98	119	140	161	182	203	
3.5.....	31	51	71	91	111	131	151	171	191	
3.6.....	26	45	65	85	105	125	145	165	185	
3.7.....	26	45	64	83	102	121	140	159	178	
3.8.....	25	43	61	79	97	115	133	151	169	
3.9.....	23	40	57	74	91	108	125	142	159	
4.0.....	23	39	55	71	87	103	119	135	151	
4.1.....	23	39	54	69	84	99	114	129	144	
4.2.....	23	37	51	65	79	93	107	121	135	
4.3.....	23	36	49	62	75	88	101	114	127	
4.4.....	23	35	47	59	71	83	95	107	119	
4.5.....	21	33	45	57	69	81	93	105	117	
4.6.....	17	29	41	53	65	77	89	101	113	
4.7.....	13	25	37	49	61	73	85	97	109	
4.8.....	12	24	36	47	59	71	83	95	107	
4.9.....	10	21	33	45	57	69	81	93	105	
5.0.....	10	21	33	44	55	66	77	88	99	
5.1.....	9	20	31	42	53	64	75	86	97	
5.2.....	8	19	30	41	52	63	74	85	96	
5.3.....	7	18	29	40	51	62	73	84	95	
5.4.....	7	18	28	39	50	61	72	83	94	
5.5.....	7	18	28	38	48	58	68	78	88	
5.6.....	7	17	27	37	47	57	67	77	87	
5.7.....	6	16	26	36	46	56	66	76	86	
5.8.....	5	15	25	35	45	55	65	75	85	

the  $-3$  z-score, we assigned a particular z-score value to the zero error score. This value was calculated from the normal probability curve to be the most probable position of the cases making zero scores. For example, if a zero score might have any z-score value from  $-1.0$  to  $-3.0$ , the probable value would be approximately  $-1.4$  rather than  $-2.0$ , since the frequency of scores is greater nearer the mean than at the extreme.

Referring again to Billy's profile of errors, we obtained the z-scores for each error-type from the appropriate table. We interpolated the score values between the points read from the curves by approximating the distance in tenths, as shown in the tabulation of profile of errors.

BILLY'S PROFILE OF ERRORS

Error-Type	Proportionate Number for 500 Words	z-Score for Reading Grade 3.3
Vowels . . . . .	23	-0.3
Consonants . . . . .	19	+0.8
Reversals . . . . .	5	-2.2
Addition of sounds . . . . .	13	0.0
Omission of sounds . . . . .	12	0.0
Substitution . . . . .	1	-0.5
Repetition . . . . .	5	-0.8
Addition of words . . . . .	1	-0.7
Omission of words . . . . .	1	-0.7
Refusals and aid . . . . .	7	+1.1
Total errors . . . . .	87	-0.7

The following examples are given in order to make clear the process of obtaining the z-scores:

Billy's score in vowel errors is 23 (proportionate score for 500 words). Referring to Table IX, and looking opposite to the average reading grade score of 3.3 (Billy's average reading grade), we find the row of figures shown in the accompanying tabulation for vowels.

AVERAGE READING GRADE SCORE	VOWELS								
	z-Scores								
	3-	-2	-1	0	+1	+2	+3	+4	+5
3.3 . . . . .	3	11	18	25	33	40	48	56	63

The difference between the successive numbers for each *z*-score is 7 or 8 (as read from the smoothed curves of Fig. 20, decimals corrected). Billy's score of 23 vowel errors gives him a *z*-score placement between -1 and 0. Since the distance between 18 and 25 is 7 units, Billy's score of 23 is five-sevenths of the way between -1 and 0, or -0.3 *z*-score.

Billy's score in consonant errors is 19 (proportionate score for 500 words). Referring to Table X, and looking opposite to the average reading grade score of 3.3, we find the row of figures shown in the accompanying tabulation for consonants.

AVERAGE READING GRADE SCORE	CONSONANTS								
	<i>z</i> -Scores								
	-3	-2	-1	0	+1	+2	+3	+4	+5
3.3.....	0	3	9	14	20	26	31	37	42

The difference between the successive numbers for each *z*-score is 5 or 6. Billy's score of 19 consonant errors gives him a *z*-score placement between 0 and +1. Since there are 6 units between 14 and 20, Billy's score of 19 is five-sixths of the way between 0 and +1, or +0.8 *z*-score.

In similar fashion, *z*-scores for each of the error types were obtained from the table. It is probably sufficiently accurate for practical work to use the nearest *z*-score or half *z*-score, instead of the tenth *z*-score obtained in this study.

Billy's profile of errors was portrayed graphically on the chart, Figure 21, which shows the high and low points of his errors. The error-types are indicated by symbols in the same order as given in the foregoing list.

From this chart we can make the following conclusions as to Billy's reading performance. He is a cautious child who makes fewer total errors than most children of the same reading grade. His errors are all within the most frequent range from +1 *z*-score to -1 *z*-score, with the exception of two error-types. He makes very few reversals compared with other children of his reading grade. He does not attempt to read words which he does not know

but refuses them or asks for aid more frequently than do other children of his reading grade. He has no outstanding difficulties with reading, although he might be encouraged to try the hard words by himself and become more independent of external aid. His reading index of 1.00 shows that his reading achievement is in harmony with his other accomplishments. His profile of errors is typical of that of most average readers, in that the error-types are

### Profile of Errors

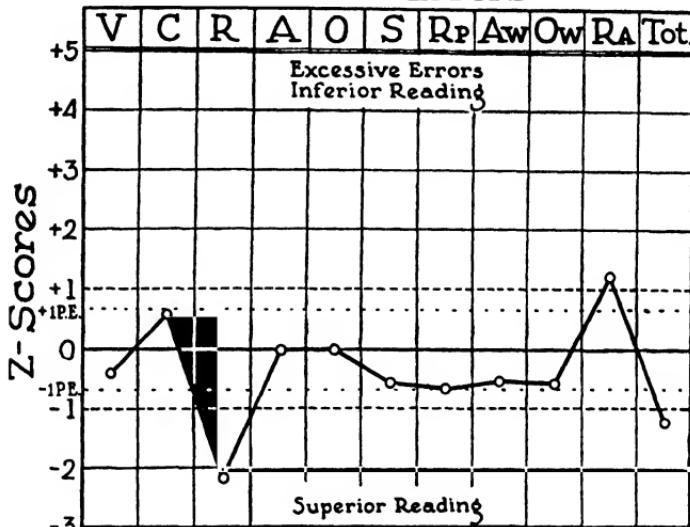


FIG. 21.—Case 19, Billy. Reading index, 1.00

usually within the  $\pm 1$  z-score range, with one or two exceptions above or below.

#### COMPARISON OF ERRORS OF READING-DEFECT CASES AND CONTROLS

Children who have difficulty in learning to read, however, generally make more errors at each reading grade than do those who have no trouble in learning to read. In order to compare the errors made by the controls and the reading-defect cases, the means and standard deviations of the z-scores were calculated. Since the reading grades of the controls range from 1.4 to 5.8, it was necessary to exclude from the reading-defect cases all children

whose reading grades fell outside of this range. Two hundred and thirty-three reading-defect cases from the clinic and special groups had reading grade scores within the range of the control. The results of the comparison are given in Table XX. The means and standard deviations of the controls offer a check on the standardization of the *z*-scores. If the norms are accurate, the mean *z*-score of the controls should be 0 and the standard deviation should be 1.

TABLE XX  
COMPARISON OF *z*-SCORES OF CONTROLS AND READING-DEFECT  
CASES IN THE PROFILE OF ERRORS

ERROR-TYPE	CONTROLS		READING-DEFECT CASES		DIFFERENCE BETWEEN MEANS DI- VIDED BY THE STANDARD ERROR OF THE DIFFERENCE
	Mean <i>N</i> = 101	<i>σ</i>	Mean <i>N</i> = 233	<i>σ</i>	
Vowels.....	-0.003	0.975	+1.060	1.730	7.13
Consonants.....	+ .017	0.995	0.635	1.305	4.75
Reversals.....	- .017	0.979	0.886	1.362	6.89
Addition of sounds..	- .010	1.030	0.489	1.259	3.44
Omission of sounds..	+ .016	1.038	0.971	1.656	6.36
Substitution.....	- .005	1.031	0.290	1.206	2.28
Repetition.....	+ .017	0.981	0.893	2.073	5.21
Addition of words....	- .007	1.014	0.050	1.451	0.41
Omission of words....	+ .000	1.038	0.297	1.490	2.09
Refusals and words aided.....	-0.009	1.020	+0.265	1.456	1.97
Total errors.....	-0.003	0.975	+1.127	1.482	8.24

The actual values are close to these figures. The means vary from -0.017 to +0.017 and the standard deviations vary from 0.975 to 1.038.

The reading-defect cases as a group greatly exceed the controls in their errors in the following types: total errors, vowels, reversals, omission of sounds, repetition, consonants, and addition of sounds. They exceed the controls slightly but not significantly in the following types: substitution, omission of words, refusals and words aided, and addition of words. The reading-defect cases are more variable in their errors than are the controls, as shown by the larger standard deviations of all error-types, particularly repetition, vowels, and omission of sounds.

## CHAPTER IV

### TYPICAL INDIVIDUAL PROFILES OF ERRORS

The profile of errors gives a measure of the qualitative differences between a child's reading performance and that of other children of his own reading-grade level. The extent of his variation from the normal tendency can be measured for each error-type. The profile of errors is of practical value in that it assists in the diagnosis of the specific difficulties which an individual has in learning to read. We have selected a series of profiles of errors which illustrate some of the types of variation encountered. The profiles are almost as varied as the number of children examined, but may be roughly classified on the basis of the outstanding error-types. Usually more than one error-type was found to be excessive for each individual, and certain groups of error-types tended to appear together.

#### EXCESSIVE ERRORS IN THE SOUNDS OF WORDS

The first group of profiles indicates excessive errors in dealing with the sounds of words, such as altering the vowel or consonant sounds, or adding or omitting sounds.

*Case 20.*—George was eleven years and one month of age when examined, and earned a mental age of twelve years and four months, Stanford-Binet I.Q. 112. Reading achievement was low fourth grade, with a reading index of 0.71. Spelling was even lower than reading, measuring second grade. George was co-operative in taking the tests, trying hard. He was well poised and had an unusually good attitude toward his reading and spelling difficulty, remarking, "I don't mind having to work hard if you think I'll finally get it." That he had already worked hard was evidenced by a report from his teacher who had been giving him special reading and spelling drills all year which had resulted in considerable improvement.

George's mother has a marked speech defect due to a cleft palate. George does not have a speech defect but finds it very difficult to discriminate between words of similar sounds. For example, he said that "dime—dine" pronounced for him orally were "just alike," as were also "catching—cash-

ing," etc. Whether his confusions are due to association with his mother's faulty articulation or to specific weakness in auditory word discrimination is not known. Hearing is reported normal for intensities of sounds. He was unable to retain more than three sounds and blend them in word-building. For example, he combined the sounds *t-r-ai-n* as "rain," *m-y-s-e-l-f* as "mice," etc.

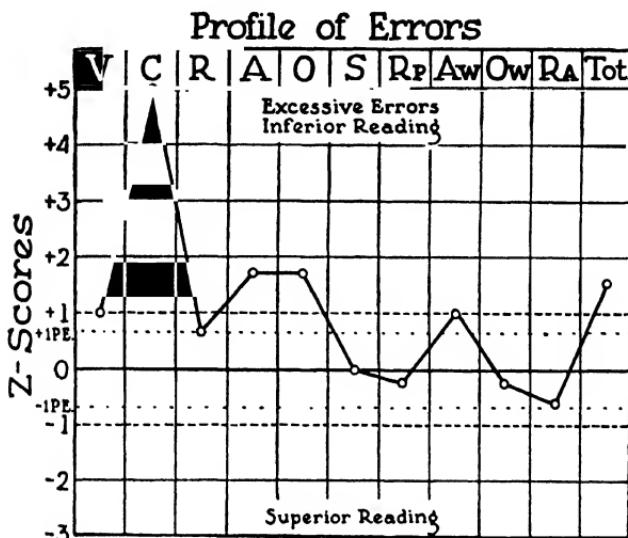


FIG. 22.—Case 20, George. Reading index, 0.71

George's profile of errors in reading is given in Figure 22. His extreme difficulty with consonants is shown by his marked variation from the average.

Examples of his errors are shown by such mistakes as "nip" read "tip," "rank" read "tank," etc. In spelling, the same errors were present, as "ask" spelled "ast," "news" spelled "neut," etc. His most frequent substitution for any sound was *t*. Aside from consonant errors, his profile shows a tendency to insert and omit sounds, to insert words, and shows excessive total errors.

*Case 21.*—Roland was ten years and eight months of age when examined, with a mental age on the Stanford-Binet examination of ten years and nine months, I.Q. 101. He could read with very low second-grade achievement, and his reading index of 0.40 represented a severe degree of reading defect. He worked persistently on the tests and seemed to do his best. He had a sensitive, timid manner and seemed to feel his inadequacy keenly. He had a mild articulatory speech defect characterized by such speech errors as "box" pronounced "bock," "farm" pronounced "fahm," etc. He modified the

sound of *s* and had difficulty in blending it with other consonants, usually omitting it in the blends. There was no abnormality in the speech organs. Hearing was reported normal for intensities of sounds. He habitually kept his mouth very nearly closed while speaking so that the vowel sounds were indistinct and muffled.

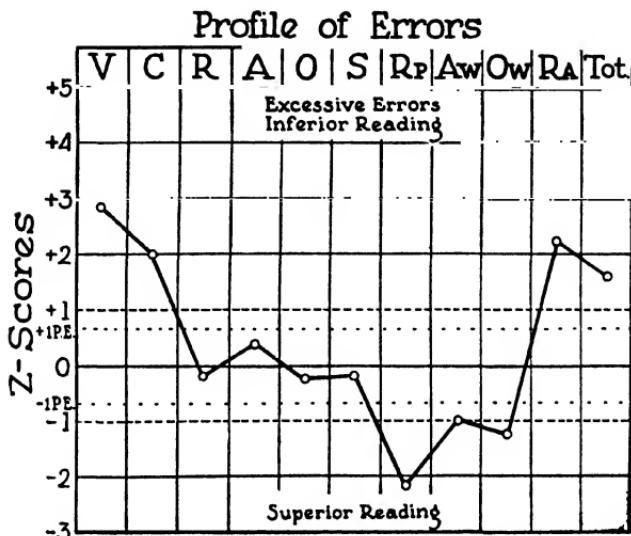


FIG. 23.—Case 21, Roland. Reading index, 0.40

Roland had difficulty in blending sounds in word-building when the sounds were pronounced for him. Thus, he combined the sounds *t-r-ai-n* as "taken," *l-i-ll-le* as "let," etc.

Roland's errors in reading are represented in Figure 23. It will be seen that he exceeds the expected range in vowels, consonants, words refused and aided, and total errors. Examples of his vowel errors are: "tap" read "tip" then "top," "sung" read "sing," "fare" read "fire," etc. Examples of his consonant errors are "park" for "part," etc. Often vowel and consonant errors were combined in the same mispronunciation, as "tack" read "tom," "chuck" read "coke," etc. His refusals were generally of polysyllables. He seemed to have no attack on long words but simply stared at them, meanwhile flushing with embarrassment. He was usually aware of his errors in the small words, shaking his head and trying the word in different ways.

In tabulating the reading errors of a speech-defect case, we tried not to penalize the child for his speech errors, but only tabulated mispronunciations which did not occur in spontaneous speech. Thus, if Roland called "farm" "fahm" in speech, he was not penalized with a sound-omission in reading

when he read "farm" as "fahm." He was, however, tabulated with a sound-omission if he read "farm" as "fah," since this latter mispronunciation did not occur in speech.

**Case 22.**—Herbert is a bright child who is so deaf that he cannot reply to questions asked in an ordinary conversational tone when not facing the questioner. He can hear the voice of one who shouts near his ear and is clever in lip-reading. He has a speech defect which is partly caused by a missing uvula. His speech can be easily understood and is characterized by some nasality and substitution of the sounds *t* and *d* for *k* and *g*.

### Profile of Errors

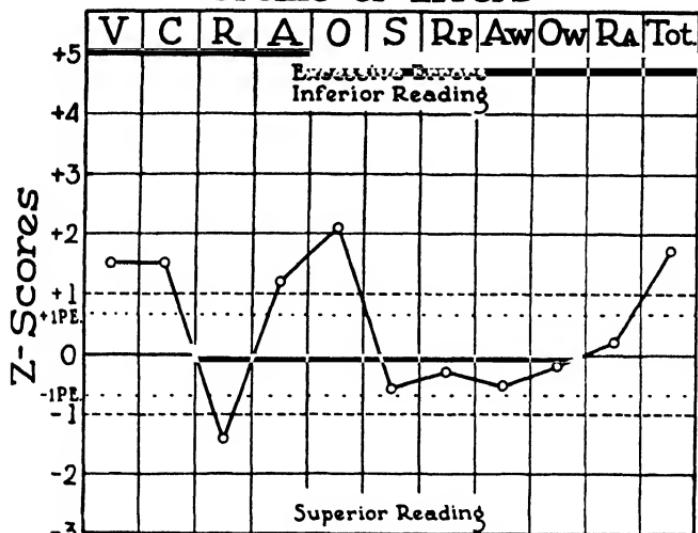


FIG. 24.—Case 22, Herbert. Reading index, 0.72

Herbert's errors are shown in Figure 24, in which his excesses in errors of vowels, consonants, sound-additions, and sound-omissions are portrayed. Examples of his errors are: *vowels*: "repaste" for "repaſt," "profession" for "profuſion," etc.; *consonants*: "grow" for "glow," "embraced" for "embraced," "trich" for "trick"; *addition of sounds*: "boys" for "boy"; *omission of sounds*: "defying" for "dignifying," "exercise" for "exercises," etc. In spelling his errors showed again his difficulty in connecting the correct sounds with their letters, as "grant" spelled "grand," "assist" spelled "at-tist," "particular" spelled "particurlar," etc. This boy's profile of errors is interesting in comparison with the two previous cases in that he has definite sensory and motor difficulties which interfere directly with speech and with the formation of correct associations between speech and its printed counterpart, while George and Roland have no such obvious physical defects.

*Case 23.*—Martin was thirteen years and three months of age when examined, with a mental age of nine years and eleven months, Stanford-Binet I.Q. 75. He was able to make a fifth-grade score in arithmetic, but could read with only third-grade ability and spell with only second-grade achievement. His reading index was 0.56. Martin is an attractive lad in personal appearance, is alert, and puts forth good effort in all the tasks asked of him. He has a mild articulatory speech defect which is characterized by such mispronunciations as "wen" for "when," "fedder" for "feather." He can articulate all the consonant sounds in isolation but makes many omissions in blend-

### Profile of Errors

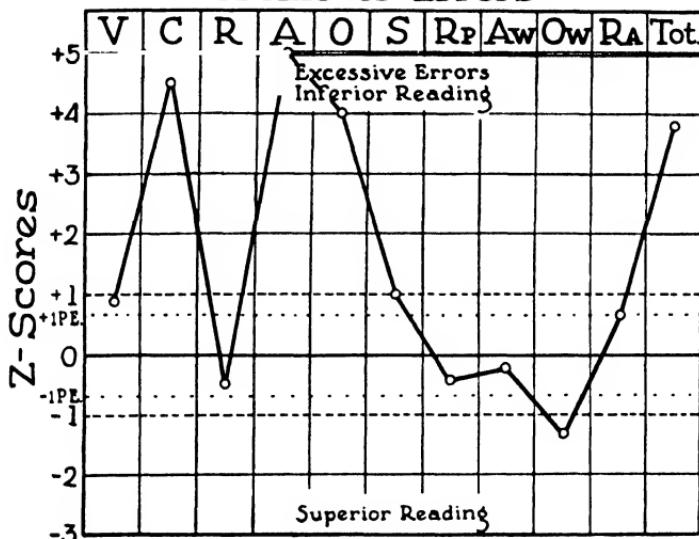


FIG. 25.—Case 23, Martin. Reading index, 0.56

ing the sounds in speech, for example, "han" for "hand," "lef" for "left," etc. His reading errors are shown graphically in Figure 25, in which his extreme excesses in consonants, sound-additions, and sound-omissions are apparent. Examples of his reading errors are as follows: *consonants*: "wend" read "rent," "crown" read "gown," "rank" read "sank," etc.; *sound-additions*: "tack" read "track," "bone" read "born," "pad" read "prod," "choke" read "croke," "glow" read "glory," etc.; *sound-omissions*: "blond" read "blot," "against" read "again," "greater" read "great," etc. In spelling, the same types of errors were present, as "stand" spelled "strain," "grant" spelled "gain," "watch" spelled "wricked," etc. Vowels and substitutions were also slightly excessive.

The following incidents further illustrate Martin's difficulties in sound-perception: He was asked to point to the "onion" among several pictures.

He pointed to the "Indian." He asked for the spelling words to be repeated several times, seeming unable to hold the word in mind long enough to write it.

#### EXCESSIVE ERRORS IN ORIENTATION AND SEQUENCE OF LETTERS AND WORDS

The second group of profiles indicates excessive errors in dealing with the spatial patterns of letters, words, and phrases, as printed or written, so that the child disorients them, transposes the position of letters or their sequence, and repeats words previously read.

*Case 24.*—Edward was nine years and five months of age when examined, with a mental age of nine years and eleven months, Stanford-Binet I.Q. 106. He was able to do third-grade arithmetic but only first-grade reading and spelling, his reading index being 0.48. He was consistently left-handed and left-eyed, as indicated by all the tests given him. Vision and hearing were reported normal. In all motor activities he was awkward and slow. He was not welcome in a group of boys playing ball because he could rarely catch a ball or pitch one within several yards of the batter. His speech was fluent, vocabulary excellent, and in oral description and narrative he was entertaining and interesting.

His errors in reading are represented graphically in Figure 26. His excesses in reversals and repetition are shown by his marked variation from the normal tendencies in these errors. There was also a slight excess in addition of words. Reversals are exemplified by the following errors: "Carl" read "crawl," "chew" read "chwee," "form" read "from," "saw" read "was," b, d, p, q interchanged, "done" read "bone," etc. His errors in repetition are shown by the following sample of his reading taken from Gray's Oral Reading Paragraphs:

*Text:* Once there was a little pig. He lived with his mother in a pen. One day he saw his four feet.

*Read:* Once there was a little girl, a little girl. She lived with her, with *h-i-s* [spells] his mother his mother in a barn. One day she was one day he was he was four little feet little feet.

The paragraph consumed several minutes and when the child completed it he sighed and said, "Now doesn't that sound terrible?" He spontaneously began pointing at the end of the first line, indicating thereafter each word with the forefinger of the left hand, meanwhile turning the page on the table farther and farther clockwise until he was finally looking at the print upside down.

*Case 25.*—Helen was fourteen years old when examined, having a mental age of fourteen years and two months, I.Q. 101. She was in the sixth grade at school; scored seventh grade in arithmetic but only third grade in reading.

Her reading index was 0.39 and represented a severe degree of reading defect. Her mother and sister are left-handed, although Helen herself is right-handed on all the tests given and also preferred the right eye in sighting. Vision and hearing are normal and speech is distinct and fluent. She has had unusual opportunities in foreign travel, and in general culture, from which she has profited. Helen surpasses her associates in athletics; she is an expert swimmer and plays golf well. In physical development she is large for her age, being frequently mistaken for a young woman of eighteen or twenty. It has been difficult for her to adjust to a grade placement with children who are immature, and to be unable to compete with them in reading and spelling.

### Profile of Errors

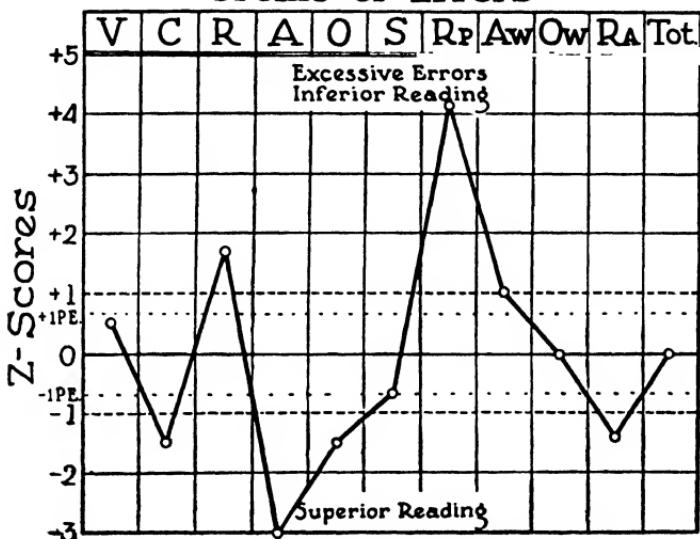


FIG. 26.—Case 24, Edward. Reading index, 0.48

Helen's errors are portrayed in Figure 27. Examples of her reversals are as follows: "on" read "no," "saw" read "was," "tarnish" read "tarshin," "dull" read "lurd," "tar" read "track," etc. In spelling, "baby" written "bady," "liberty" was written "lidity," etc. Her numerous repetitions are shown in the following passage from Gray's Oral Reading Paragraphs:

**Text:** One of the most interesting birds which ever lived in my bird-room was a blue-jay named Jackie. He was full of business from morning till night, scarcely ever still.

**Read:** One of the most the most interesting birds with which even every ever lived lived in my bird-home was a blue-jay named Jackit, named Jackit. He saw saw full of *b-u-s* [tries to sound out word, blocks until aided] from morning till night till night scratchly ever still ever still.

Vowels and sound-additions were slightly excessive, but not to the extent of the reversals and repetitions.

Helen read a passage from the mirror fluently and with few errors. She was able to reverse the direction of writing with facility and without error.

*Case 26.*—John is a boy who stutters. He was ten years and three months of age when examined, with a mental age of ten years and ten months, Stanford-Binet I.Q. 106. Arithmetic measured fourth grade in achievement; reading and spelling indicated low second grade, with a reading index of 0.50. John is right-handed and prefers the right eye in sighting. His sister is left-handed. John's speech is variable, being free from impediment at times, but at other times causing him considerable embarrassment.

### Profile of Errors

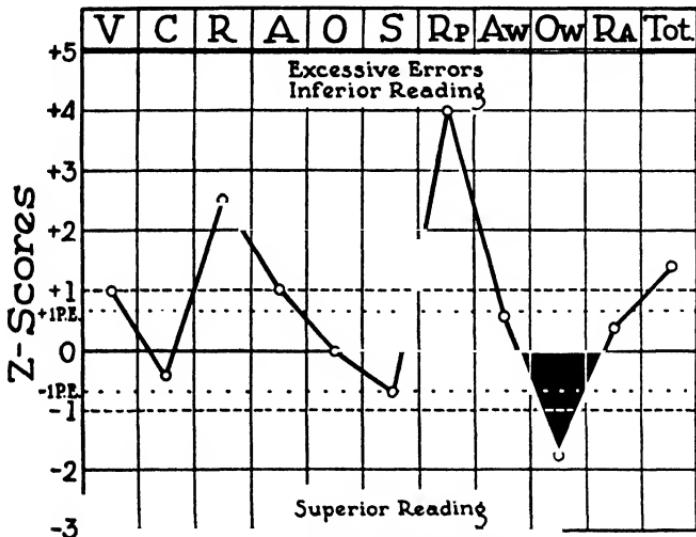


FIG. 27.—Case 25, Helen. Reading index, 0.39

His errors are shown in Figure 28. Examples of his reversals are as follows: "blind" read "build," "plea" read "peal," "contrast" read "corn-tast," etc. Examples of his repetitions are shown in the following passage from Gray's Oral Reading Paragraphs:

*Text:* It was one of those wonderful evenings such as are found only in this magnificent region. The sun had sunk behind the mountains but it was still light.

*Read:* It was one of those it was one of those w-w-w-wonderful evenings s-s-such as are found only in the magazine in the magazine range. The sun had skun the sun had skun behind the m-m-mountains but it was still light still light.

John was a fluent mirror-reader and showed no stuttering while reading from the mirror. He was unable to write in the reversed direction, however. He confused b and d, p and q, and reversed numbers as well as letters, reading "61" as "16," etc. Reversals were present in spelling as well as reading, "catch" being spelled "cacht," "unless" being spelled "lensun," etc.

### Profile of Errors

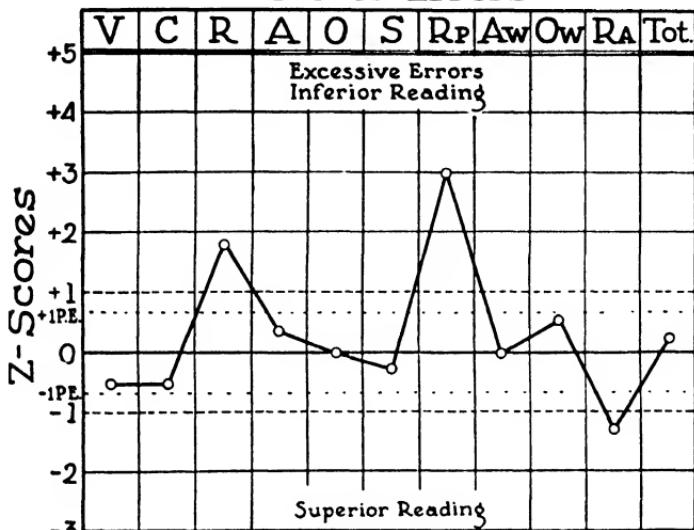


FIG. 28.—Case 26, John. Reading index, 0.50

### COMBINATIONS OF VARIOUS EXCESSIVE ERRORS

A third group of profiles is presented to show cases in which the two previous types are combined. Some of our most severe cases of reading disability not only had many errors of reversals but also many errors in the sounds and sound-combinations of words.

*Case 27.*—Jean is a little girl who was eight years and eleven months of age when examined, and who had a mental age of nine years and one month, Stanford-Binet I.Q. 102. Arithmetic measured third grade; spelling and reading indicated low first grade, the reading index being 0.41.

Jean is right-handed in her preferences on the series of handedness tests given, but prefers the left eye in sighting. Her father is left-handed. Hearing, vision, and speech are normal. She fails to combine sounds orally in word-building. For example, she combined *t-r-ai-n* as "ten," *b-r-ow-n* as "bow," etc. Her errors are shown graphically in Figure 29.

Examples of her mistakes follow: *vowels*: "ball" read "bell," "ran" read "run," etc.; *consonants*: "done" read "tone," "had" read "has," etc.; *re-*

versals: "dig" read "big," "dug" read "good," "deb" chosen for "bed," "em" chosen for "me," etc.; addition of sounds: "saw" read "sweet," "go" read "got," etc.; omission of sounds: "card" read "car," etc.

This little girl is very much confused in reading. She is unable to differentiate successfully either the sound-combinations of spoken words or the spatial orientation of the printed symbols.

### Profile of Errors

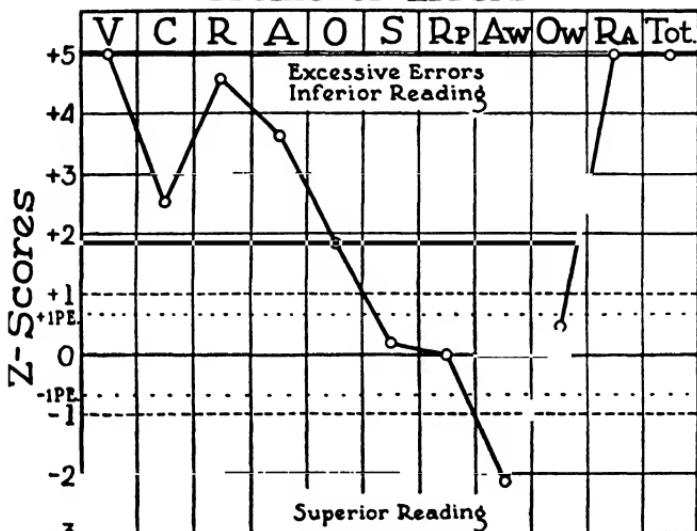


FIG. 29.—Case 27, Jean. Reading index, 0.41

### EXCESSIVE ERRORS IN A CASE OF READING DISABILITY IN AN ADULT

*Case 28.*—Miss A is a young woman who is enrolled as a Junior in X University. She was referred as a special case by her adviser because of her difficulties with some of the university courses. Miss A, in giving her history, said that she had never been able to learn to read very well but that her teachers in the elementary schools had always promoted her because of perfect arithmetic papers and excellent class recitations. Many of the teachers had tried to help her learn to read as had also her mother and members of the family, but without much success. In high school the teachers were willing to give her grades on oral recitations, thinking that she had a rare visual defect. She had graduated from high school and had attended a normal school for two years, specializing in physical education, in which work she showed talent. She had earned her credits, had them transferred to X University, and was working toward the A.B. degree with the hope of ultimately becoming a director of physical education in a high school or college.

The quantity of reading and writing required by her courses at the university was so great, however, that she began to receive failing marks in spite of having her papers "edited" for spelling by friends and having others read aloud to her whenever possible. If she was forced to depend upon herself, her rate of reading was so slow that it was impossible for her to cover more than a small portion of each assignment. Also, the classes were large and there was little opportunity for oral recitation.

Miss A's vision was thoroughly checked and no abnormality was discovered. Hearing was also normal. She has no speech defect but occasionally "blocks" in recalling words, according to her own statement. She was given the Stanford-Binet intelligence test, since she was unduly penalized on any of the adult college-entrance tests which depend upon reading. On the Stanford-Binet test she earned an I.Q. of 99 and a rating of "average adult" on the complete form, and an I.Q. of 107 on a condensed form in which the tests most affected by reading were eliminated.<sup>1</sup> Her failures on the complete Stanford-Binet test on the years below the superior-adult level were as follows: Year X, failed reading the passage; Year XII, failed the dissected sentences which involve reading words; Year XIV, failed arithmetic problems which she could not read, and failed the clock test which probably involves imagery of the spatial position of the clock hands; Year XVI, failed the vocabulary test on which she may have been penalized by lack of normal reading opportunities, and failed the code test, which probably involves imagery of spatial position of the letters in the code key and requires spelling.

Miss A's average reading achievement on the series of reading tests was found to be low fourth grade. Speed of reading was only third grade. She was unable to read any of the Gray's Oral Reading Paragraphs perfectly, making errors on even the simplest first-grade material. We could not calculate a reading index as she was above our age-grade norms. With a reading achievement of only fourth grade, it must have been a very laborious, if not altogether impossible, task for Miss A to do the reading required for a university course. She remarked, "I know it's hard work but I want an education and a college degree. I can understand the lectures, and when someone reads the books to me I can understand them. But when I have to do my own reading—well, I begin early and I quit late."

Miss A's errors are shown graphically in Figure 30. She shows marked variation from the standards for fourth-grade children in vowels, consonants, reversals, addition of sounds, omission of sounds, total errors, and a slight excess of substitutions. Examples of her mistakes follow: *vowels*: "chuck" read "check," "glow" read "glew," "maple" read "mapple," "fare" read "far," etc.; *consonants*: "cart" read "chart," "grim" read "jim," "atten-

<sup>1</sup> Donald D. Durrell, "The Effect of Special Disability in Reading on Performance, on the Stanford Revision of the Binet-Simon Tests" (Master's thesis, University of Iowa, 1927).

tively" read "attensively," etc.; *reversals*: "Carl" read "clare," "form" read "from," "crad" selected for "card," "brun" selected for "burn," "teer" selected for "tree," etc.; *addition of sounds*: "pray" read "praise," "house" read "houses," "possession" read "prossession," etc.; *omission of sounds*: "dignifying" read "defying," "persistently" read "pertently," etc.; *substitutions*: "the" for "and," "the" for "my," etc. It was almost impossible for a listener to tell what she was reading, because of her many errors, although she herself could repeat surprisingly well the content of the passage read.

Her difficulties with discrimination and blends of sounds are shown by such errors in oral sound-combination as *sh-oe* combined as "should," *m-e*

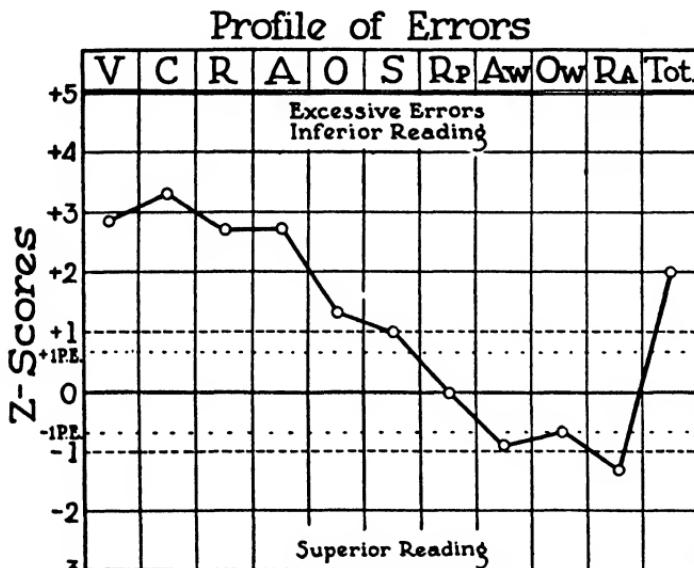


FIG. 30.—Case 28, Miss A. Reading index, undetermined

combined as "many," *b-r-ow-n* combined as "burn." In giving the rhymes of the nine-year Stanford-Binet test, she gave "day, stay, start, play, pay," "mill, bill, boy, pill, till," etc. Although she passed the test, she had, for an adult, unusual difficulty with it. Her difficulties in discrimination of spatial orientation are shown by errors in identifying *b*, *d*, *p*, *q*, etc. She was able to read from a mirror with fewer errors than is usual for her reading grade and could also reverse the direction of writing easily. She was right-handed and right-eyed on all the handedness tests given.

Miss A represents a case of severe reading difficulty in an adult of average intelligence. She has been able to make an unusually good social adjustment in spite of her handicap, and, in personality, is a pleasant, attractive young woman of considerable determination and drive.

## EXCESSIVE ERRORS IN A CASE OF BRAIN INJURY

*Case 29.*—Louis is a boy who had a birth palsy and who shows a marked disturbance in speech. The report on the neurological examination is as follows: "There is no gross defect in any of the cranial nerves. No hemianopsia. Some clumsiness is noted in making unilateral facial movements. Perhaps there is some apraxia of the tongue, especially on movements to the right side. The lower extremities show pronounced rigidity of passive movements. No tremors or involuntary movements are noted anywhere. His pupils react well to light and in accommodation. The patellar reflexes are increased on both sides. There is a bilateral positive Babinski sign, also positive Chaddock, Oppenheim, Gordon. No clonus. The gait is broad, rather propulsive, not spastic, slightly ataxic, especially when turning around or walking along a straight line. The Romberg sign is negative. There is some hypotonia. The positive Babinski sign with increased patellar reflexes and the rigidity of the lower extremities point definitely to a central lesion. The lesion is most likely congenital, in the nature of infantile palsy. The speech disturbance observed in the patient must, therefore, be classed as a residual aphasia."<sup>1</sup>

The speech defect was characterized by such mispronunciations as "yitta" for "little," "wun" for "run," "whel" for "where," "bewy" for "very," "guh" for "girl," "vif" for "with," "tan" for "stand," etc. It was difficult for anyone not acquainted with him to understand his speech. He usually did not attempt to speak unless pressed to do so, in which case he would patiently repeat his replies to questions as often as necessary to be understood. In personality he was an earnest, conscientious boy but one who felt so inadequate because of his speech defect that he avoided making social contacts whenever possible.

Louis was fourteen years and one month of age when examined, with a Stanford-Binet mental age of thirteen years and eleven months, I.Q. 98. Arithmetic measured eighth grade and was up to standard for his age. Reading achievement was low third grade, spelling mid-second grade, and the reading index was 0.37. The errors made in reading are portrayed in Figure 31. In checking vowel and consonant errors in reading, a differentiation was made between reading errors and speech errors. Words were counted as correctly read if given in the same articulation which occurred in spontaneous speech. For example, when Louis read "a little boy and girl" as "a yitta boy an guh," he was not penalized with consonant errors and omissions in reading since the mispronunciations occurred in speech as well as in reading. Louis's reading errors are excessive both in reversals and in the error-types dealing with sounds. Examples of his reading errors are as follows: *vowels*: "glow" read "glew" (pronounced "gyew"), "parse" chosen for "purse,"

<sup>1</sup> The writer is indebted to Dr. A. A. Low, University of Illinois College of Medicine, for the report of the neurological examination in this case.

"weth" chosen for "with," "care" read "car" (pronounced "cah"); *consonants*: "he" read "we," "rude" chosen for "rule," "stared" chosen for "scared," "park" chosen for "part," etc.; *reversals*: "tar" read "tra" (pronounced "twah"), "blind" read "build" (pronounced "biya"), "no" chosen for "on," "bag" chosen for "dog," "deb" chosen for "bed," "tirck" chosen for "trick," etc.; *additions of sounds*: "ever" read "every" (pronounced "ebwy"), "tap" read "trap" (pronounced "twap"), etc.; *omission of sounds*: "interesting" read "interful" (pronounced "intafu"), "fishing" read "fish," etc.

### Profile of Errors

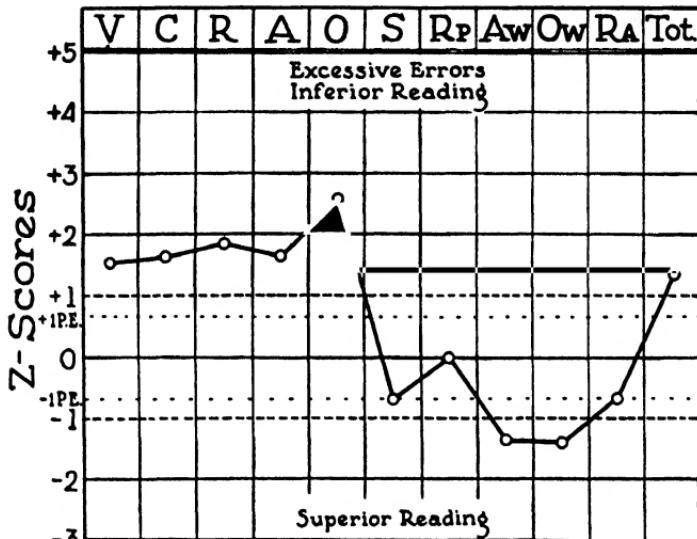


FIG. 31.—Case 29, Louis. Reading index, 0.37

The same types of errors appeared in his spelling. It was almost impossible to decipher his spontaneous writing. His attempts at the test words were shown by such errors as "walk" written "wark," "direct" written "disrest," "enough" written "endend," "station" written "stains," etc.

Louis was right-handed on all the tests given but preferred the left eye in sighting.

### EXCESSIVE ERRORS IN AN ADULT WHO HAS LOST THE ABILITY TO READ

*Case 30.*—Miss C is a young woman who lost the ability to read after an attack of encephalitis. She is a college graduate and a very intelligent person. Since recovery from her illness a year ago she has been unable to return to

work because she cannot read. She has a right homonomous hemianopsia.<sup>1</sup> She gave the following history of the visual disturbances following her illness. Although she could see objects, she had difficulty in recalling their names. Space perception was disturbed so that it was impossible for her to locate objects by vision as she could not tell whether they were near or far or to the right or left. She would reach for an object on the right when it was really on the left, or she would bump into objects while trying to avoid them. Color vision was also affected but the colors gradually returned. Spatial orientation was also gradually reacquired. Miss C reported at the time of the examination that her visual perceptions seemed to be very much as they were before her illness, aside from the darkness on the right side of the visual field and from her inability to read.

In the examination Miss C was presented with pictures of objects to look at. These she named with a slight hesitation on one or two objects. Reactions to pictures were about those expected from any normal adult except for the occasional slight pauses and evident insecurity.

She was then presented with letters. These she named accurately although she hesitated over m, w, b, d, p, q, u, n, f, t. She resorted to tracing over several letters with the finger before she could identify them by name.

She was then presented with words. These she found difficult and could not recognize as units. She could recognize them after spelling aloud the letters composing the words. In long words she had to keep track of the letters by pointing to each one. She was inclined to become confused in sequence and would transpose the letters unless she used the hand to keep place. By the spelling method she could sometimes recognize hard words, such as "diphtheria." When asked to read the words as units she guessed at the words from one or two letters, such as "ball" for "tell." She said, "I recognized the two l's but couldn't get the other letters. I thought the word might be 'ball,' but that is just a guess."

Miss C was then asked to write. She wrote quickly and fluently any passage dictated with no hesitations or misspellings. Kinesthetic and auditory memories for words were easily accessible. Penmanship was legible, well formed, and pleasing.

She was asked to read what she had written, the words being presented in mixed order. She could not identify the words again although she could work them out by the previous laborious method of spelling.

In other than visual fields Miss C was quick and accurate. Her vocabulary was excellent and her speech fluent.

Miss C's errors in reading are plotted graphically in Figure 32. Her errors are compared with norms for fifth-grade readers in this chart. Her reading

<sup>1</sup> The writer is indebted to Dr. Robert Blue, Chicago, for the report of the visual examination in this case.

achievement cannot adequately be measured on a grade scale, however. Given time to identify each letter and spell each word, she could sometimes read words not ordinarily known by persons of less than university education. In spelling the words by letters, she was inaccurate as she sometimes confused some of the letters. In attempting to recognize words as units, she failed words of primer difficulty. She fatigued quickly and was apparently under great strain of effort and concentration while attempting to read. The average time for recognition of words was ten seconds per word.

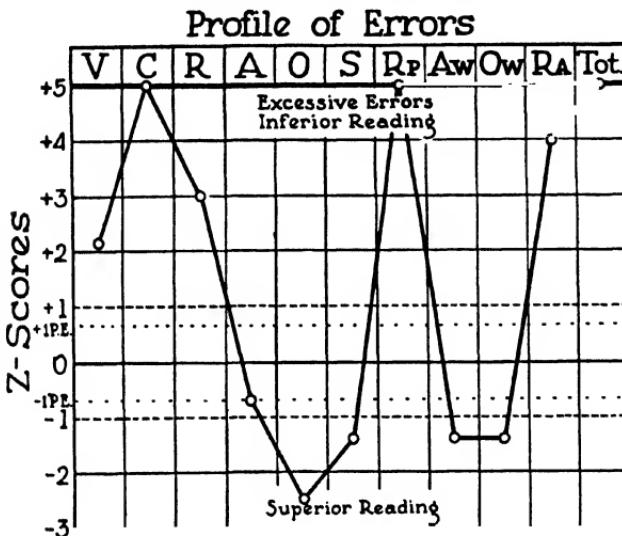


FIG. 32.—Case 30, Miss C. Reading index, undetermined

Her errors show a large number of vowel and consonant errors, reversals, repetitions, and words refused. Examples of her mistakes are: *vowels*: "woods" read "weeds," "Jack" read "Jake," etc.; *consonants*: "on" read "or," "glow" read "slow," etc.; *reversals*: "not" read "out," "pod" read "bad," etc. Repetitions occurred in trying to get a cue from the meaning which might aid her in recognizing the word logically without the laborious process of spelling. Refusals occurred when she could not identify the letters or when she lost track of them before reaching the end of the word.

#### EXCESSIVE ERRORS UNDER PRESSURE FOR SPEED

A fourth group of profiles is presented to show reading defects in which the child has certain detrimental attitudes or habits of reading which interfere with progress. Overemphasis upon speed

of reading in some cases seems to result in an excess of omissions of sounds and words. Overemphasis upon contextual cues in some cases seems to result in an excess of substitutions and inserted and omitted words. Emotional reactions to reading and certain methods of word analysis bring about excesses in various errors.

*Case 31.*—Richard was twelve years and ten months of age when examined, with a mental age of twelve years and three months, Stanford-Binet I.Q. 96. Arithmetic measured fourth grade; reading and spelling measured second grade. Richard's reading index was 0.42 and represents a serious de-

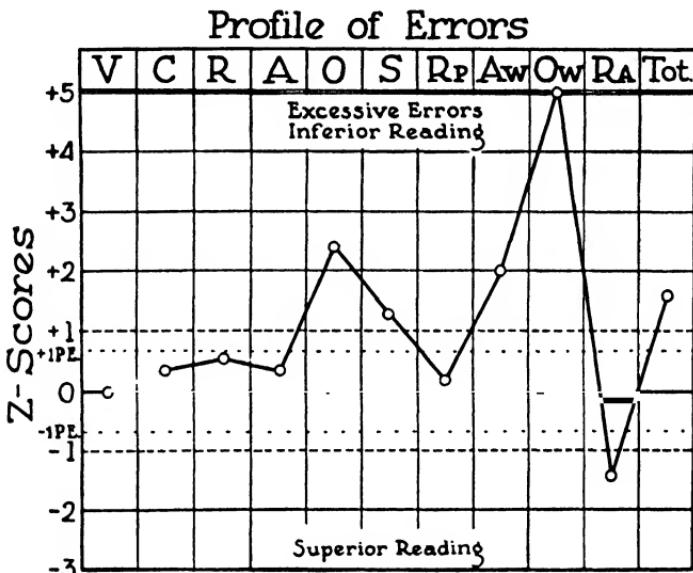


FIG. 33.—Case 31, Richard. Reading index, 0.42

gree of retardation. Richard has a very slight visual defect for which he wears glasses. His hearing is normal. He has no speech defect. He is right-handed and also right-eyed on the series of tests given. He tried to read very rapidly and became somewhat breathless in the process. His attitude expressed apology and his personality was that of a child who seems overwhelmed by his inadequacy and inability to compete. His feeling of inferiority was exaggerated by comparison with siblings of superior capacity and by overcritical parents who tried to hold him to the same standards of accomplishment as the other children. His errors are shown graphically in Figure 33. He deviates from the standards for his reading grade in omissions of sounds, substitutions, addition of words, omission of words, and total errors. Examples of his errors follow: *omission of sounds*: "farming" read

"farm," "palace" read "place," "enjoyed" read "enjoy," etc.; *substitution*: "a" read "the," "my" read "the," "the" read "and," etc.; *addition of words*: "the king and queen" read "the king and the queen"; *omission of words*: "he had been given to me as a pet" read "he had given me a pet." Richard not only omitted sounds from words, words from sentences, but also skipped complete lines in the text with no apparent recognition of the disruption of thought which resulted. He could analyze difficult words correctly when asked to read slowly but he could not hold himself to a rate slow enough for accuracy for more than a minute without reverting again to his previous breathless haste. His rate of reading was actually not more rapid than that of average second-grade readers but it seemed so because of his tension and effort. He would read a few words very rapidly, hesitate for a while over a strange word, breathing rapidly, and then hastily read a few more words. Thus, the time consumed for the paragraph did not indicate actual speed. The following passage illustrates his manner of reading (hyphenated words were read rapidly):

*Text*: The part of farming enjoyed most by a boy is the making of maple sugar.

*Read*: The-part-of-the-farm [block] enjoy-most-by-the-boys-is-[block] making-the-map [block] maple-sugar.

#### EXCESSIVE ERRORS IN IMPROVISED READING

*Case 32*.—Carl was nine years and eight months of age when examined, with a mental age of eight years and five months, Stanford-Binet I.Q. 87. He is a little boy who has a vivid imagination and an environment which is not a happy one, owing to a broken, poverty-stricken home, and an alcoholic father. He was able to make a third-grade score in arithmetic but only a first-grade score in reading and spelling, the reading index being 0.39 and representing a severe degree of retardation. Carl, although unable to recognize words accurately, enjoys the stories in the books and can "read" from pictures and memory well enough to deceive a listener. On unfamiliar test material which is not illustrated, however, he could identify only a few words. From these he built a story, omitting words and parts of words and substituting words as needed. His profile of errors is given in Figure 34. Examples of his mistakes follow: *omission of sounds*: "card" read "car," "Jackie" read "Jack," etc.; *substitution*: "lived" read "was," "and" read "he," etc.; *omission of words*: "He wanted the dog to go home" read "He wanted to go home." The meaning of the text was often completely disrupted, as in the following passage:

*Text*: —— he had been given to me as a pet.

*Read*: —— he had give me the little pan.

On the supplementary tests we found that Carl had some difficulty in combining sounds in word-building although he could discriminate words of

similar sounds. The difficulty in sound-blending may have interfered with his learning to utilize a phonetic method of word analysis and hence may have intensified the tendency to read from fancy and from a few recognized words or portions of words.

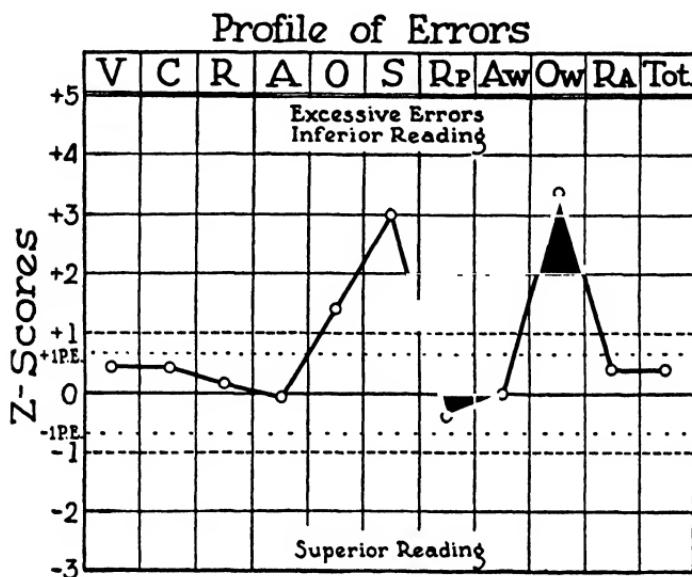


FIG. 34.—Case 32, Carl. Reading index, 0.39

**THE USE OF THE PROFILE OF ERRORS IN DIAGNOSIS  
OF READING DIFFICULTY**

The profile of errors in reading gives a measure of the child's reading performance, in relation to that of average children, by indicating his deviations from the normal tendencies in error-types. Each error-type which deviates greatly from the norm should be further analyzed, and the reason for the deviation should be determined if possible. Thus, the profile of errors directs us to certain tendencies for investigation and assists in finding possible explanations for the child's difficulties in learning to read.

In a few cases, however, the profile of errors does not reveal any outstanding deviations in children who are, nevertheless, severely retarded in reading. We found it possible, for example, that a child may have a tendency to disorient the spatial pattern of words and

yet to proceed so cautiously in reading, by spelling or sounding each word, that he makes no more reversals than do average children. In such cases, deviations from the normal tendency were observed not in type of error but in slow rate of speed, in method of attack, and in supplementary tests. It was possible, also, for the reading disability to be primarily related to emotional or environmental factors which made the child resistant to learning even though his actual performance was qualitatively normal. In some cases the child's difficulty with reading was not in the mechanics of the process but in comprehension, or in the utilization of the content, of the material read. Such children sometimes did not show deviations from the normal in their reading errors. In the majority of cases, however, the profile of errors was found to be a valuable technique, assisting in the diagnosis and directing us in the choice of remedial methods for the individual.

The profile of errors is limited in its applicability to children whose reading achievements, regardless of their ages or grade placements, are between 1.4, or low first grade, and 5.8, or high fifth grade. It is probably more accurate in the range 2.0-4.9. We are extending the technique to the lower levels for the total non-readers and children of first-grade reading achievements and to the higher levels for upper grades and high-school reading, utilizing somewhat different test materials.

## CHAPTER V

### CAUSATIVE FACTORS IN READING DEFECTS

Learning to read is a complex process which may be facilitated or impeded by a variety of conditions, both within and without the individual. Learning to read necessitates the formation of certain bonds whereby an individual is enabled to respond in an organized way to the printed symbols for objects and relationships. The response usually involves a reproduction of the speech represented by the printed symbols. The speech response in reading may be one of actual articulation, as in oral reading, or one of thought, as in silent reading. Speech, furthermore, involves concepts, meanings of words, relationships, etc., and is frequently enriched with imagery. An individual, during the process of reading, may become so attentive to the meanings or imagery aroused that he is oblivious to the words which carry the thought. It is also possible for an individual to respond directly to the printed symbols without the process of speech, in instances when the meaning may be thought of in other ways than in speech. For example, the printed pattern "up" may arouse a motor set instead of a word. Speech, however, is a convenient way of thinking, and since the child on entering school has already acquired a large number of speech symbols, these symbols are usually associated with the printed ones as an intermediate link between the printed symbols and their meanings. Reading is, thus, intimately connected with speech, and may be regarded as a parallel system of language which is usually built up from speech.

In learning to read, certain structures and organizations are necessary. The individual must have an adequately organized nervous system for receiving visual stimulation and for correlating these impressions with systems of verbal responses. The individual must also have built up the verbal organizations which are to be correlated with the printed symbols. He must be able to direct his attention with some persistency to the visual and verbal

symbols. A certain "readiness" for reading is therefore necessary. In usual practice, children are regarded as having acquired the prerequisite organizations of language and attentional stability by the time they are six years old. Some schools require both a mental age and a chronological age of six as a further assurance of adequate background for reading. Learning to read is a prolonged process which extends over several years, and which is subjected to many influences of methods, attitudes, interests, motivations, distributions of time and effort, and almost all the factors which affect any learning process.

In considering the causes for a child's failure to learn to read, we must inquire into a great number of possible impeding factors, both in his constitutional organization and in his environment.

#### DEFECTS IN VISUAL ACUITY

Reading involves visual stimulation, which in turn necessitates a visual sensory apparatus, adequate for refracting upon the retina a clear-cut impression of the object seen. Defects in visual acuity may hinder a child from learning to read. If the retinal image is blurred, the child may not be able to distinguish the pattern of letters presented, and may confuse patterns which are similar, such as "band," "hand," "hard," or "oat," "cat," "eat," etc. In certain individuals of our reading-defect groups we found that lack of visual acuity was apparently a contributing cause to the reading defect. Lack of adequate visual acuity was not found to be a highly frequent cause, however, and did not distinguish the reading-defect groups from other groups of children who did not have reading difficulties. Anderson and Kelley<sup>1</sup> analyzed the physical and social data of one hundred of our reading-defect cases at the Institute for Juvenile Research. These one hundred reading-defect cases were paired with one hundred clinical cases of children having the same C.A., M.A., I.Q., and sex, but who were satisfactory readers. Seventy-seven per cent of the poor readers were found to have visual acuity above eight-tenths vision in both eyes as compared with 73 per cent of the good readers.

<sup>1</sup> *An Inquiry into Traits Associated with Reading Disability*, "Smith College Studies in Social Work," II, No. 1 (September, 1931).

Refraction was recommended in approximately the same number of cases for poor and good readers. Poor visual acuity is undoubtedly a hindrance to reading, causing eyestrain and discomfort in individual cases but it does not necessarily disrupt the learning process. The visual examinations tested the ability to discriminate forms. The examinations did not, however, include tests for muscular balance, binocular vision, peripheral acuity, or extent of visual fields—factors which may prove to be of importance if quantitatively measured.

#### DEFECTS IN DISCRIMINATION OF COMPLEX VISUAL PATTERNS

The perception of visual patterns involves more of the nervous system and brain than simply the sensory apparatus. Patterns vary in complexity, and a child who can discriminate simple patterns such as letters may not be able to discriminate complex patterns such as words. The literature on aphasias and word-blindness gives many records of cases who, after brain injury, were still able to read letters although they could not read words composed of the letters. Hinshelwood<sup>1</sup> proposed the hypothesis that children who were unable to learn to read but who presented no difficulty in visual acuity were "congenitally word-blind," owing to failure of certain localized areas of the brain to develop their functions. He drew this conclusion from cases of reading disability who resembled cases of "acquired word-blindness," which occurred after injury to specific cortical areas. Head<sup>2</sup> describes cases of individuals who, after brain injuries, lost the ability to read words but could recognize the isolated letters composing the words. Lashley<sup>3</sup> does not find evidence for such clearly localized functions of the brain as posited by previous investigators. Injuries disrupt not so much the specific functions as the organization of functions. The higher the degree of organization required for the function, the more it is affected by cortical injury. "An

<sup>1</sup> James Hinshelwood, *Congenital Word Blindness*. London: H. K. Lewis & Co., 1917.

<sup>2</sup> H. Head, *Aphasia and Kindred Disorders of Speech*. Cambridge University Press, 1926.

<sup>3</sup> K. S. Lashley, *Brain Mechanisms and Intelligence*. Chicago: University of Chicago Press, 1929.

apparent word-blindness may be due, not to loss of visual memory for the words, but to an inability to see the letters in a definite spatial arrangement."<sup>1</sup> From Lashley's studies it appears that the most highly organized functions suffer most from cortical injury, and are the most difficult for re-education. Reading, which necessitates so complex an organization, may be more easily disrupted by cortical injuries than less complex organizations of responses.

Anderson and Kelley,<sup>2</sup> in their comparison of one hundred reading-defect cases with one hundred satisfactory readers, tabulated the data from the health histories and physical examinations of the children. The tabulation of the number of illnesses and accidents occurring in the two groups of children is presented here-with.

Illness or Accident	Clinic Reading Cases <i>N</i> = 100	Clinic Control Cases; Normal Readers <i>N</i> = 100
Birth injuries.....	5	0
Neurological (epileptic seizures, spinal meningitis, encephalitis, convulsions).....	15	14
Surgical (operations on abscessed ears, mastoids, tonsillectomies, adenoidectomies, appendectomies, etc.).....	57	46
Infectious (measles, mumps, chickenpox, whooping cough, scarlet fever, diphtheria, smallpox, influenza, bronchitis, pleurisy, pneumonia).....	248	259
Head blows (skull fractured, head injured in automobile accident, etc.).....	7	6

Such data are, of course, difficult to interpret. A neurological illness in one case may involve totally different structures and leave different residual effects from those in another case. One instance of infectious illness may be mild, while another may be serious and have widespread complications. A skull fracture may result in an injury to the cortex in one case and not in another. Individuals in giving histories of illnesses and accidents may vary,

<sup>1</sup> Lashley, "Basic Neural Mechanisms in Behavior," *Psychological Review*, XXXVII (Jan. 1930), 17.

<sup>2</sup> *Op. cit.*

also, in their reports; some individuals attach more importance to illnesses than others.

These data do not give us much insight into the brain injuries which our reading-defect cases have actually sustained, although possible neurological injuries may have occurred in 27 per cent of the poor readers (summarizing birth injuries, neurological illnesses, and head injuries) as compared with 20 per cent of the good readers. Six of the twenty-seven reading-defect cases received complete neurological examinations and were definitely diagnosed as having brain injuries of various kinds and extents. In all these cases the reading defects were severe, and the individuals, in their efforts to read, showed excessive difficulties in the complexity of the patterns which they could discriminate.

There were no significant differences between good and poor readers in number of diseases, operations, and accidents occurring during the school ages, so that any relationship between illness and reading defects probably would not result primarily from disrupted school attendance.

#### DEFECTS IN DISCRIMINATION OF ORIENTATION AND SEQUENCE OF PATTERNS

Orton<sup>1</sup> suggests the hypothesis that reading disability is due not to an organic defect in the brain but to failure to train the brain to work exclusively from the dominant or leading hemisphere, so that, if a clear-cut unilateral dominance is not established, a confusion arises which prevents the immediately successive linkage of the visual stimulus with its meaning. Comfort<sup>2</sup> and Dearborn<sup>3</sup> present findings which show a larger incidence of mixed dexterity among poor readers than among good readers.

We analyzed the hand-and-eye preferences of the children in

<sup>1</sup> Samuel T. Orton, "‘Word Blindness’ in School Children," *Arch. Neur. and Psychiat.*, XIV (1925), 581-615; "An Impediment in Learning To Read—a Neurological Explanation of the Reading Disability," *School and Society*, September, 1928, pp. 286-90.

<sup>2</sup> F. D. Comfort, "Lateral Dominance and Reading Ability" (paper read before the American Psychological Association, September 11, 1931, Toronto).

<sup>3</sup> W. F. Dearborn, "Ocular and Manual Dominance in Dyslexia" (paper read before the American Psychological Association, September 12, 1931, Toronto).

the reading-defect groups and in the control group of one hundred and one school children, to determine the relationship between dexterity and reading difficulty. Four handedness tests were given. Three trials with a cardboard cone were made by each child to determine eye preference. The results are presented in Tables XXI and XXII.

The reading-defect cases and the controls had about the same percentage of right- and left-handedness. There was a tendency for the special and defective cases to thread a needle in a left-handed fashion more frequently than did the controls. Hand preferences, on the whole, showed little significant differences among the groups. Eye preference, on the contrary, showed significant differences. Among reading-defect cases there was a greater proportion of children who preferred the left eye in sighting, and who showed right-hand dominance with left-eye dominance.

Opposite hand-and-eye dominance may be an impediment in the co-ordination of directional responses. The child who prefers his left eye may adjust more easily to objects on the left side of the visual field than on the right side, and may tend to move his eyes in the direction of the preferred field. In moving the eyes from a central point toward the left, the right field of vision becomes obstructed by the bridge of the nose, but the left field is free. In moving the eyes toward the right, the left field of vision becomes obstructed by the bridge of the nose but the right field is free. The development of the progressively to-the-right movements demanded in reading may be more difficult for a left-eyed child than for a right-eyed child.

In moving the right hand and arm from a central point toward the left, movement, after a short arc, is impeded by the body, but movement to the right is unimpeded. A child who has the same eye-hand dominance will have the same directional preference in both eye-and-hand movements, while a child of opposite eye-hand dominance may have diverse directional preferences. It may be difficult for children of the latter type to make those complex co-ordinations of hand-and-eye movements which are involved in the development of space perception. We shall, for convenience, call the right-handed, right-eyed children "pure dextrals," and the right-handed, left-eyed children, "mixed dextrals"; the left-

# CAUSATIVE FACTORS IN READING DEFECTS 85

handed, left-eyed children, "pure sinistrals," and the left-handed, right-eyed children, "mixed sinistrals."

TABLE XXI

### HAND-AND-EYE PREFERENCES OF CONTROLS AND READING-DEFECT CASES

Test		Controls N = 101	Clinic Reading Cases N = 215	Special Reading Cases N = 155	Defective Reading Cases N = 44
Hand used in writing name	{ R L	89% 11	88% 12	91% 9	90% 10
Thumb on top in folding hands	{ R L	49 51	50 50	44 50	43 57
Hand preferred in batting ball (active side in batting)	{ R L	87 13	90 10	92 8	85 15
Hand preferred in threading needle (active hand in pushing)	{ R L	85 15	83 17	71 20	76 24
Eye preferred in sighting on three tests	{ R L Mixed	65 26 9	50 43 7	54 40 6	40 50 4

TABLE XXII

### HAND-AND-EYE RELATIONSHIPS OF CONTROLS AND READING-DEFECT CASES

Relationship	Controls N = 101	Clinic Reading Cases N = 215	Special Reading Cases N = 155	Defective Reading Cases N = 44
Writes with R hand Sights with R eye	59%	47%	51%	38%
Writes with R hand Sights with L eye	21	35	35	48
Writes with L hand Sights with R eye	6	3	3	2
Writes with L hand Sights with L eye	5	8	5	8
Writes with R hand Sights with either eye	9	6	5	4
Writes with L hand Sights with either eye	0	1	1	0

The reversal errors in reading made by the pure and mixed dextrals were analyzed to determine whether there were signifi-

cant differences. In making the comparisons we used the *z*-scores of reversals in the profile of errors. We regarded writing with the right hand as the criterion for right-handedness and required consistent preference for one eye on all three trials as the criterion for eyedness. The tabulation of the results is given herewith for those children whose profiles of errors fell within the norms of the test.

HAND-AND-EYE PREFERENCES	CONTROLS		READING-DEFECT CASES (CLINIC AND SPECIAL GROUPS)
	Mean <i>z</i> -Score	Mean <i>z</i> -Score	
	Reversals	Reversals	
Pure dextrals.....	-0.122 ( <i>N</i> = 60)	+0.700 ( <i>N</i> = 101)	
Mixed dextrals.....	+0.192 ( <i>N</i> = 21)	+0.950 ( <i>N</i> = 75)	
Difference between means divided by its standard error.....	1.34	1.41	
Pure sinistrals.....	Only a few cases	+0.682 ( <i>N</i> = 12)	
Mixed sinistrals.....	Only a few cases	+0.482 ( <i>N</i> = 8)	

The means are slightly higher for the mixed dextrals in both the control and the reading-defect groups than for the pure dextrals, but the difference is a slight one which does not hold as statistically significant. The reading-defect cases, both pure and mixed dextrals, exceed the controls in reversals to a greater extent than the mixed dextrals of either group exceed the pure dextrals of the same group. The results of the pure and mixed sinistrals are given by way of interest although there are too few cases for the results to be reliable. The tendency for left-eyed children to make more reversal errors than right-eyed children is present in all three groups, although no one group alone shows the tendency reliably.

It may be that mixed dexterity does not so much influence the type of error in reading as it impedes the facility of progressive movements to the right. Judd<sup>1</sup> and others have pointed out the fact that, during reading, the poor readers have many more re-

<sup>1</sup> C. H. Judd, W. S. Gray, C. T. Gray, K. McLaughlin, C. Schmitt, and A. R. Gilliland, *Reading: Its Nature and Development*, "Supplementary Educational Monographs" (Department of Education, University of Chicago, 1918), Vol. II, No. 4.

C. H. Judd and G. T. Buswell, *Silent Reading: A Study of Various Types*, *ibid.*, No. 23.

gressive eye movements than have the good readers. We gave a large number of children a mirror-reading test, in which the eye movements of reading must be reversed. We gave them also a mirror-writing test (see Appendix for mirror-reading and mirror-writing tests).

The ability to read from the mirror may vary somewhat with reading achievement. A child who has had no experience in reading would fail to read both with and without the mirror, even though he may be potentially a fluent mirror-reader. The paragraph to be read was one taken from a primer and contained easy first-grade vocabulary. To insure that the children were not penalized by reading achievements inadequate for the text, we included in the tabulation only records of children whose average reading achievements on four reading tests were second, third, and fourth grades and who would, therefore, be expected to read primer material without difficulty. The results of the tests are given in Table XXIII.

The mixed dextrals exceeded the pure dextrals in speed of reading from the mirror in both control and reading-defect groups. This difference is marked and holds as statistically significant in the reading-defect cases. The mixed dextrals also had fewer errors in mirror-reading than had the pure dextrals. This difference is negligible in the reading-defect groups but is marked, and statistically significant in the control groups. The mixed dextrals had a slightly greater fluency in mirror-writing, but the difference between the means is slight and does not hold as statistically significant. The pure sinistrals of the reading-defect groups were more fluent mirror-readers and mirror-writers than were the mixed sinistrals. The sinistrals, both pure and mixed, were better mirror-writers than were the dextrals. The children's actual reading-grade achievement as measured by the four reading tests was approximately the same for all of the groups.

The reading-defect groups were better mirror-readers and mirror-writers than were the controls of the same handedness-classification. The pure dextrals of the reading-defect group were highly similar to the mixed dextrals of the controls in their performances on the mirror tests. Mirror-reading seemed to be facilitated

TABLE XXIII  
MIRROR TESTS

TEST	CONTROLS				Diff. σ Diff.	
	Pure Dextrals N = 33		Mixed Dextrals N = 18			
	Mean	σ	Mean	σ		
Reading grade: Average reading achievement on four tests.....	3.4	0.8	3.5	0.8	0.42	
Mirror reading: Time.....	156.2''	50.0''	128.8''	48.6''	1.83	
Errors.....	17.9	10.7	10.9	4.7	3.24	
Mirror-writing: Successes.....	6.4	2.7	7.8	2.8	1.73	
READING-DEFECT CASES						
TEST	Pure Dextrals N = 62		Mixed Dextrals N = 42		Diff. σ Diff.	
	Mean	σ	Mean	σ		
	3.4	0.9	3.3	0.9	0.52	
Reading grade: Average reading achievement on four tests.....	3.4	0.9	3.3	0.9	0.52	
Mirror-reading: Time.....	121.2''	59.0''	76.6''	40.4''	4.47	
Errors.....	10.3	7.5	9.5	7.5	0.54	
Mirror-writing: Successes.....	7.3	3.0	8.3	3.1	1.70	
READING-DEFECT CASES						
TEST	Pure Sinistrals N = 12		Mixed Sinistrals N = 8		Diff. σ Diff.	
	Mean	σ	Mean	σ		
	3.5	1.2	3.5	1.1		
Reading grade: Average reading achievement on four tests.....	3.5	1.2	3.5	1.1	Too few cases for reliable comparison	
Mirror-reading: Time.....	85.8''	30.6''	103.4''	39.8''		
Errors.....	8.6	0.7	10.9	9.1		
Mirror-writing: Successes.....	11.0	2.9	10.2	2.1		
Population from which this table was drawn:						
Total children examined with mirror tests.....						
Discarded, owing to mixed or unreliable determination of eye dominance..						
Discarded, owing to reading achievement below 2.0.....						
Total remaining children.....						

by left-eyedness primarily while mirror-writing seemed to be facilitated by left-handedness.

The measurement of handedness is a controversial subject. It is difficult to separate the influences of heredity and environment in this as in other human traits. Children who are left-handed may be trained to write with the right hand, or may shift to the right hand after an accident to the left hand. Some shifting from the right to the left hand may occur, even though social custom and environment favor the use of the right hand and discourage the use of the left hand. Ocular dominance may be influenced by greater visual acuity in one eye, or may possibly influence, or be influenced, by hand dominance. Whether the eye tends to follow the movement of the hand, or vice versa, may also be a matter of individual difference. Our tests showed simply the hand-and-eye preferences which were present in the child at the time of the examination, regardless of whether the preferences were innate or acquired. Two per cent of the controls and 4 per cent of the reading-defect cases reported change of handedness. Fourteen per cent of the right-handed controls and 25 per cent of the right-handed reading-defect cases reported left-handedness in their immediate families, i.e., among either parents or siblings.

Hand preference may have a second type of measurement, that of the ratio of facility of the two hands. Two children may appear to be right-handed in manner of writing the name, batting a ball, threading a needle, etc., and yet one child may be able to repeat the performances with the left hand equally well, while the other child may be almost totally unable to use the left hand. As a measure of the ratio of facility, we had the child write his name first with the accustomed hand and then with the unaccustomed hand, and compared the time required. A child who required ten seconds to write his name with the accustomed hand and twenty seconds to write his name with the other had a preference ratio of 2.0 in this performance. The lower the preference ratio, the more nearly similar the child's facilities with the two hands. The results of the children who took the tests are given in Table XXIV.

The ratios show an increase with age, the younger children hav-

ing more nearly equal facilities with the two hands than the older children. The groups were separated into mixed and pure dextrals to determine the influence of eyedness on the preference ratio. In the reading-defect group, there was a slight tendency for the children who were left-eyed but right-handed to have lower preference ratios than the pure dextrals, but this tendency was not observed in the controls. The control groups were therefore placed together in the table. The reading-defect cases were not significantly different from the controls of the same ages in preference ratios.

TABLE XXIV  
RATIO OF FACILITY IN WRITING NAME WITH ACCUSTOMED  
AND UNACUSTOMED HAND

YEARS OF AGE	CONTROLS		READING-DEFECT CASES			
	Both Pure and Mixed Dextrals		Pure Dextrals		Mixed Dextrals	
	Mean Ratio	No.	Mean Ratio	No.	Mean Ratio	No.
6 and 7 . . . . .	1 7	29	2 0	11	1 8	10
8 and 9 . . . . .	2 3	50	2 3	41	2 3	37
10 and 11 . . . . .	.....	.....	2 7	46	2 5	21
12 and 13 . . . . .	.....	.....	2 7	30	2 5	24
14 and 15 . . . . .	.....	.....	2 8	32	2 7	21

To summarize the findings on the relationship between hand-and-eye preference and reading disability, we may point out the following trends: There is a significantly greater incidence of left-eye preference and of left-eye preference with right-hand preference among the reading-defect cases than among the controls. Left-eye preference, moreover, is associated with fluent mirror-reading, and fluent mirror-reading is associated with reading disabilities. There is a slight tendency for left-eye preference to be associated with reversal errors in reading. Reading-defect cases report a larger incidence of changed handedness, and of left-handedness among members of the immediate family than do the controls.

A simple explanation of the relationship between reading disability and hand-and-eye preference is presented on the basis of

the proposition that space perception is developed and co-ordinated through motor responses.<sup>1</sup> We attribute to visual objects the spatial characteristics of near, far, up, down, right, left, etc., through adaptive bodily movements. Among the directional movements toward visual objects, there are ocular movements as the eye adjusts to various parts of the visual pattern, and manual movements as the hand manipulates the object. A child whose ocular and manual movements are inconsistent in preferred direction may have some difficulty in developing a spatial organization which contributes consistently the meaning of "right" or "left" to the visual pattern. Children who are left-eyed may also encounter difficulty in adjusting to the conventional eye-movements of reading. Similarly, children who are left-handed may encounter difficulty in adjusting to the conventional manual movements of writing. The effect of ocular and manual preferences on reading may vary for different individuals. In some cases there may be no observable effect as shown by cases of good readers who are left-eyed, or right-handed and left-eyed. In other cases the effect may be observed in slow rate of reading rather than in reversals, mirror-reading or mirror-writing. There are, moreover, a number of other factors which may produce the same manifestations in reading. Reversals may be associated with confused auditory patterns or with lack of precision in motor control. Children of superior intelligence may make superior scores in mirror-reading and mirror-writing because they can intelligently transpose sequence and quickly adapt to new organizations of responses. The relationship between hand-and-eye preferences and reading disabilities may be obscured because of these many variables. Further controlled experimentation is needed to disclose the nature of the relationship.

#### DEFECTS IN SPEECH RELATED TO READING DISABILITIES

Learning to read involves speech and language as well as vision and visual perception. The child must be able to understand and use the speech symbols which are to be associated with the printed symbols. The factors which affect speech may therefore also affect

<sup>1</sup> Harvey A. Carr, *Psychology* (Longmans, Green & Co., 1925), chap. vii, p. 136.

reading. Speech is influenced by age, intelligence, environment, and a number of specific constitutional factors, such as ability to discriminate the sounds of words, and to make the necessary motor co-ordinations of lips, tongue, palate, larynx, breathing apparatus, etc., which are involved in smooth, accurate articulation.

We analyzed the speech defects of our reading-defect cases to see how they compared with the controls. The results are given in Table XXV.

TABLE XXV  
SPEECH DEFECTS OF CONTROLS AND READING-DEFECT CASES

DEFECT	READING-DEFECT CASES <i>N</i> = 415	CONTROLS <i>N</i> = 101	INSTITUTE FOR JUVENILE RESEARCH CASES	
			White Boys <i>N</i> = 2,853	White Girls <i>N</i> = 1,739
Stammering or stuttering	9%	1%	4%	2%
Articulatory defect:				
Infantile speech . . . . .				
Lisping . . . . .	18	7	12	11
Mispronunciations, etc. . . . .				
Total. . . . .	27	8	16	13

The comparison is made not only between the reading-defect cases and the controls, but also involves the five thousand problem children brought to the Institute for Juvenile Research. The latter data were analyzed by Dr. Luton Ackerson.<sup>1</sup> The reading-defect cases had many more speech defects than the controls. They also had more speech defects than unselected cases from the Institute for Juvenile Research, who presented general behavior problems. Defective speech may be considered a factor in reading disability, either as one cause of the reading defect or as a result of a common cause.

Inaccurate articulation may directly affect reading by presenting a confusion in the sounds of words to be associated with the

<sup>1</sup> *Children's Behavior Problems* (Chicago: University of Chicago Press, 1931). I, 79.

printed symbols. A child who has an articulatory defect hears the word as spoken by others in one way and as spoken by himself in another way. Either of the two memories may be aroused on presentation of a printed word. Thus, he may read "pig," "pid" in his own articulation. He may, similarly, read "beg," "bed," since he substitutes the d for g in speech. Now "bed" may arouse a totally different meaning from "beg." The child may therefore develop confusions in reading in both mechanics and comprehension which would not have been present if his articulation were accurate.

#### DEFECTS IN DISCRIMINATION OF SPEECH SOUNDS

Inaccurate articulation and reading disability may come from a common cause, the inability to discriminate successfully the sounds of words. The child models his articulation to match the auditory pattern of the word as presented by another. When he can give himself the same auditory stimulus which is given by another person, the word will appear to himself to be correctly articulated. If his auditory discrimination is poor, he may confuse similar words in both speech and reading without recognizing the error. He may, however, learn to articulate not on the basis of sounds but on the basis of imitation of movement of the lips and speech organs. Thus, many of our reading-defect cases, in addition to those noted in Table XXV, have histories of speech defects although the defect was not observed in the examination. The poor sound discrimination may offer a confusing factor in the formation of associations between words and their visual symbols. A child who cannot differentiate the words "send," "sand"; "bud," "but"; or "dime," "dine," etc., when he hears them will have to depend upon other cues, context, etc., to get their proper meanings. The formation of the visual auditory associations in reading may therefore be complicated through the lack of precision in audition.

To determine the influence of poor auditory discrimination upon reading defects we compared a group of non-readers with a group of unselected children. In each case the child was asked to turn his back to the examiner, so that he could not reply to the test words through lip-reading. The examiner then slowly and

clearly articulated twenty pairs of words, some of which were the same (as "was," "was") and some of which were different (as "send," "sand"; "huts," "hunts"; "catching," "cashing," etc.). The child was asked after each pair of words to reply either "same" or "different" (see Appendix for auditory word-discrimination test). The child's errors were noted on the test. The test was given to thirty-two unselected first-grade children, and to thirty-two young non-readers, a random sampling of the young

TABLE XXVI  
AUDITORY WORD-DISCRIMINATION TEST AND VISUAL-AUDITORY  
LEARNING TEST

TEST	CONTROLS; UNSELECTED FIRST-GRADE CHILDREN		READING-DEFECT CASES; SAMPLING OF YOUNG NON READERS		DIFFERENCE BETWEEN MEANS DIVIDED BY ITS STAND- ARD ERROR	
	Mean C.A., 6.9 Mean M.A., 7.4 Mean I.Q., 109 N = 32		Mean C.A., 8.5 Mean M.A., 8.4 Mean I.Q., 99 N = 32			
	Mean	$\sigma$	Mean	$\sigma$		
Number of errors in auditory word dis- crimination . . . .	1.51	1.11	4.58	2.94	5.49	
Number of successes in visual-auditory learning test . . . .	7.28	3.00	4.53	3.34	3.52	

reading-defect cases at the Institute for Juvenile Research. To the same groups of children was given a learning test in which the child was required to associate nonsense syllables with nonsense forms.<sup>1</sup> The examiner presented each of five nonsense forms while articulating a nonsense syllable, and then asked for a recall of the syllables on again presenting the forms. Three trials were given and the number of successes were summated (see Appendix for the visual-auditory learning tests). The results of the tests are given in Table XXVI.

The reading-defect cases differed significantly from the controls. The controls, although less mature in both chronological and men-

<sup>1</sup> The test was somewhat similar to the visual-auditory association test of A. I. Gates (*The Improvement in Reading* [Macmillan, 1929], p. 410).

tal ages than the reading-defect cases, made fewer errors in auditory word discrimination and had a larger number of successes in the visual-auditory learning test.

Lack of precise auditory discrimination was found to impede the learning which involves auditory impressions. A correlation coefficient (method of ranks)  $-.51 \pm .093$  was obtained between the number of errors made in the auditory word-discrimination test and the number of successes in the visual-auditory learning tests, for the thirty-two non-readers. A correlation coefficient was not obtained for the group of thirty-two controls. Their auditory word-discrimination errors were very few in number and had a small standard deviation, so that while the test differentiated the control group as a whole from the reading-defect cases, it did not differentiate very well among the children of the control group.

A poor score on the auditory word-discrimination test does not necessarily indicate lack of auditory acuity so far as sound intensities are concerned. Only 2 per cent of the reading-defect cases were rated as defective in hearing on the whispered-voice and watch-ticking tests, which were given during the physical examinations. These tests are inaccurate for fine measurement of auditory acuity but disclosed noticeable degrees of deafness.

The lack of auditory discrimination of words may be a special defect in hearing just as color-blindness is a special defect in vision. A person may be color-blind and yet pass the visual acuity tests for forms. In a similar manner a person may have weaknesses with regard to certain auditory qualities and yet pass the hearing tests for sound intensities. Had reading been dependent upon color instead of form (e.g., if the word "cat," instead of being composed of letters, was composed of spots of red, green, yellow), then color-blind persons would also be word-blind, or at least would have confusions among the words most affected by their particular color weaknesses. So, in audition, the lack of discrimination of certain sounds may lead to a confusion of words, which in turn affects speech, or reading, or both.

Auditory impressions of words consist not only of sound qualities, but also of the temporal distribution of sounds in a pattern. Words are articulated in a sequence of sounds. For example,

"stop" and "spot" are different, not in their sound composition but in the temporal sequence of sounds in the word pattern. The sequence is so rapidly given as to appear to be almost simultaneous in speech. A child must be able to differentiate the sequence of sounds as well as the spatial pattern of letters in vision before he can develop a phonetic system by which he can read strange or unfamiliar words. For example, a child who can read the word "ran" and the word "cat" may be able to read the word "rat" without further help by logical deduction. He must, however, first be able to recognize both the temporal sequence of the sounds and the spatial sequence of the letters, and then combine the two in proper order, before he can make the logical deduction.

In order to determine to what extent our reading-defect cases were handicapped in their perception of the sound blends of words, we gave a test of the ability to combine sounds orally in word-building. The examiner said to the child, "Now I am going to tell you the sounds of a word. Listen carefully and tell me what the word is." If the child failed to comprehend the instructions, the examiner demonstrated with the sounds of the word "shoe," saying, "Listen, sh-oe, sh-oe, shoe; do you hear how sh-oe makes shoe?" Fifteen words were sounded, the examiner articulating the sounds clearly in the correct sequence with a distinct pause between each sound, at the rate of two sounds a second (see Appendix for the sound-blending test). The test increased in difficulty from two-sound words such as "m-e," "g-o" to six-sound words such as "g-o-l-d-e-n." The score was the number of words successfully combined from the sounds. Errors were often significant as a diagnostic technique; some children changed vowel and consonant sounds, for example, "m-e" combined "may" or "be," and others changed the sequence, for example, "p-a-r-t-y" combined "pottery," etc. Additions of sounds, such as "c-a-n" combined "cotten" or omission of sounds such as "t-r-a-i-n" combined as "rain," etc., were also frequent errors. Table XXVII gives the results of the tests for 126 control children (the 101 school children of the original control group and 25 of the 32 first-grade children received the test) and 269 of the reading-defect cases.

The reading-defect group was significantly different from the

controls in the ability to combine the isolated sounds into words. Some of the reading-defect children had extreme difficulty with the test, and the group as a whole made a lower mean score than the controls. The distributions of scores for the two groups are given in the table in order to show a distinct bimodality of the distribution of the reading-defect cases. The frequencies of scores of the controls increase steadily until the mode at scores 12-13 is reached, after which the frequencies decrease. The frequencies of scores of the reading-defect cases, however, increase to one mode

TABLE XXVII  
SOUND-BLENDING TEST

Score: Number of Words Correct	Controls <i>N</i> = 126	Reading-Defect (cases <i>N</i> = 209)
0-1 . . . . .	1	18
2-3 . . . . .	4	29
4-5 . . . . .	7	47
6-7 . . . . .	15	37
8-9 . . . . .	16	20
10-11 . . . . .	31	41
12-13 . . . . .	36	55
14-15 . . . . .	10	21
Mean . . . . .	10.15	7.66
Standard deviation . . . . .	3.23	4.24
Difference between means divided by its standard error . . . . .	6.19	

at scores 4-5, and then decrease, again increasing to another mode at scores 12-13. The bimodal distribution suggests that the reading-defect cases contain two groups, or types, of children, one of which is decidedly handicapped in auditory perception of sound patterns, and the other of which is not so handicapped, but probably has other causative factors in the reading-defect.

DIFFERENT CAUSATIVE FACTORS MAY PRODUCE  
THE SAME READING ERRORS

The same excessive errors in reading may come from different causes. For example, two children may have excessive reversals, one because of difficulty in perceiving the orientation of the visual patterns, another because of difficulty in perceiving the temporal

sequence of the sound patterns. Two children may have excessive consonant errors and fail to associate the auditory and visual symbols accurately: one, owing to lack of precision in either auditory discrimination, or articulation, or both; and the other, owing to lack of correct perception of the spatial patterns. The latter case may be illustrated by this example. When not reading, a child may perceive correctly the auditory sequence of sounds in the word "cat"; he may articulate the word clearly, and discriminate the sounds precisely. He may, however, in correlating the sounds with the printed symbol, "cat," begin from right to left, thinking of the sound of c while looking at the t, thinking of the

TABLE XXVIII  
DISTRIBUTION OF SEXES IN CONTROLS AND  
READING-DEFECT CASES

	Controls <i>N</i> = 101	Clinic Reading Cases <i>N</i> = 215	Special Reading Cases <i>N</i> = 155	Defective- Reading Cases <i>N</i> = 45	All Institute for Juvenile Research Cases* <i>N</i> = 5,000
Boys.....	54%	84%	86%	94%	62%
Girls.....	46	16	14	6	38

\* Ackerson, *op. cit.*, p. 39.

sound of a while looking at a (correct association), and thinking of the sound of t while progressing on toward the left and looking at c. Thus, the child may develop a confusion between the sounds *c* and *t* and their appropriate letters, through inaccurate direction of reading. It is therefore of importance to analyze as thoroughly as possible the factors which may provoke each type of error. We cannot safely judge the child's fundamental difficulties from the observation of his reading errors only, although we can obtain from them valuable leads as to the nature of the difficulties.

DISTRIBUTION OF SEXES IN RELATION TO  
READING DIFFICULTIES

The prevalence of boys over girls in the controls and reading-defect cases was determined and is shown in Table XXVIII.

The controls are fairly evenly divided between boys and girls. The reading-defect groups have a large excess of boys over girls.

This excess cannot be explained wholly by the fact that more boys than girls are brought to the Institute for Juvenile Research, since the excess of boys in the reading-defect groups is much larger than the excess of boys among the general clinic cases. It is probable that some of the constitutional factors which impede reading are found more frequently in boys than in girls. Reading defects may be similar to color-blindness, and to a number of other biological variations in that they occur more frequently among males than among females.

#### MOTOR CONTROL IN RELATION TO READING DISABILITIES

In some individuals the reading disability was accompanied by a marked lack of precision in motor control. A number of the children in the reading-disability groups seemed to have difficulty in making the motor responses required in reading. They were unable to follow a line of words with the eyes, or in some cases, even with the finger. They seemed unable to adjust the musculature of the body to attend persistently to selected stimuli. Writing in such cases was ill formed. Sometimes speech was muffled and indistinct, seemingly as a result of clumsy movements of the speech organs. The awkwardness of movement occurred with and without history of neurological illness or pathological findings in the physical examinations.

It would be desirable to obtain a measure of the precision of motor control necessary in reading and to compare the reading-defect cases with the good readers. In the present study we did not attempt to measure motor precision but noted marked deviations whenever they occurred. In a number of cases the child's lack of precision in bodily control seemed to be one of the important concomitants of the reading disability and one which we had to consider in the selection and application of remedial methods.

#### MEANING IN RELATION TO READING DISABILITIES

In many individuals the reading disability was accompanied by poor vocabulary, or by difficulty in combining language symbols into meaningful relationships. Some children possessed vocabularies which were so limited that they were unable to grasp the

meaning of the text. Other children who had adequate vocabularies were unable to follow the organization of relationships of the words, so that the sentences were meaningless. Their own use of language consisted of very simple relationships, such as subject-predicate, adjective-noun, etc. They became bewildered in reading material which contained complex arrangements of language, such as dependent clauses, similarities, contrasts, etc., even though they had some idea of the meanings of the separate words. Difficulties in vocabulary and sentence structure were not measured in the present study, but they were important factors in the reading disabilities of a number of cases.

#### ENVIRONMENTAL FACTORS IN RELATIONS TO READING DISABILITY

Besides the constitutional variations which make it difficult for a child to learn to read, there are a number of environmental, methodological, emotional, and personality factors which may affect reading.

Among the environmental factors which influence reading may be mentioned foreign language, broken school attendance, literacy and economic position of parents, and possibly ordinal position of the child among the siblings of the family. Anderson and Kelley,<sup>1</sup> in the study previously referred to, found no significant differences between the good and poor readers with regard to any of the foregoing factors except ordinal position of the child among siblings. Five per cent of the poor readers were only children as compared with 17 per cent of the good readers. Twenty-seven per cent of the poor readers were oldest children as compared with 34 per cent of the good readers. Thirty-four per cent of the poor readers were youngest children as compared with 26 per cent of the good readers. The influence of ordinal position may be an environmental factor in that the only or oldest children probably receive a greater amount of stimulation and extra school help from their parents during their first years at school than do the later-born children, or there may exist not environmental but biological factors which affect the later-born children with regard to certain types of organic deviation.

<sup>1</sup> *Loc. cit.*

The difference between good and poor readers in proportion of oldest children may be related, not to their reading achievements, but to the types of problems found in the two groups. Thurstone and Jenkins<sup>1</sup> discovered a disproportionately high incidence of first-born children among the problem children examined at the Institute for Juvenile Research. The poor readers who were Institute cases were referred more frequently for school problems, while the good readers who were also Institute cases, were referred more frequently for social problems (see Table XXIX). The larger incidence of first-born children among the good readers may be related to their social problems rather than to their good reading. The poor readers are like the general population while the good readers are like the Institute population in proportion of first-born children.

#### METHODOLOGICAL FACTORS IN RELATION TO READING DISABILITY

Among the methodological factors which influence reading may be mentioned the following: the various methods of teaching reading, the skill and experience of teachers, the methods of motivation, the aims and goals of reading, the methods of grouping children, the stress placed upon various aspects of reading such as silent, oral, comprehension, speed, etc. The literature on educational methods contains a number of studies dealing with the relative merits of phonetic and sight methods of word-recognition, the hygienic requirements, appeal, and vocabulary of primers, and many other conditions which bear upon the effective teaching of reading. Undoubtedly the pupils of ineffectual teachers suffer in reading, and in individual cases may become retarded through the development of undesirable habits. Many of our reading-defect cases, however, were referred from excellent schools. They were sometimes brought to the examinations by teachers and principals who were progressive in educational methods, who were alert to the child's reading problems, and who had tried to help him overcome his difficulties. The controls, as a group, had received excellent training, judged by modern standards, and had

<sup>1</sup>L. L. Thurstone and Richard L. Jenkins, *Order of Birth, Parent-age and Intelligence*. University of Chicago Press, 1931.

learned to read; the reading-defect cases had, as a group, been exposed to the same types of training, often with additional help, and had not learned to read. In individual cases we found evidences of deleterious effects of certain methodological practices, such as overspeeding, or some methods of developing word-recognition. We did not, however, study the methodological factors quantitatively.

#### BEHAVIOR PROBLEMS IN RELATION TO READING DISABILITY

The children's behavior problems were tabulated for the clinic reading cases. In interpreting the data, one must bear in mind the fact that the clinic reading cases had been referred to the clinic for a variety of behavior problems and for advice on guidance, but not necessarily for reading difficulty. The reading difficulty was discovered during the course of the routine examinations. The children, therefore, had many more behavior problems than had the group of special reading cases who were referred only for reading difficulty. Psychiatric study was not given to the special reading cases, however, or to the group of unselected school children. For this reason data are available only for the clinic reading cases. If there are types of behavior which affect reading, or are affected by reading defects, the differences should be apparent in a comparison of behavior-problem children who are poor readers with behavior-problem children who are good readers. One cannot judge from the tables, however, the frequencies of behavior problems among unselected reading-defect cases, since many more problems were present in this group of children than in the group of children referred only for inability to read.

Table XXIX gives a summary of the statements made by the referring agency as to the child's problems. Usually more than one problem is given. For example, a child may be referred to the clinic because he fights, swears, and is incorrigible, or because he is timid, sensitive, and enuritic. Each statement is tabulated as frequently as it occurred. The two groups of children were different with regard to the following problems: The reading-defect cases predominated in school problems, temper tantrums, day-

TABLE XXIX\*  
DISTRIBUTIONS OF CAUSES FOR REFERRING IN CLINIC  
READING CASES AND CLINIC CONTROLS

CAUSE FOR REFERRING	100 READING- DEFECT CASES	CONTROLS	
		100 Institute for Juvenile Research Cases; Satisfactory Readers, C.A., M.A., I.Q., and Sex Held Constant by Pairing with Read- ing-Defect Cases	
Difficulties in Habits of Social Response			
Truancy...	22	22	
Stealing...	16	24	
Lying . . . . .	8	8	
Incorrigibility	14	32	
Restlessness . . .	2	1	
Quarrelsomeness	2	1	
Stubbornness.	2	4	
Sex . . . . .	1	7	
Temper tantrums	5	1	
Fighting...	1	0	
Swearing...	1	0	
Smoking ..	0	1	
Tardiness	0	1	
Lack of respect	0	1	
Gang membership	0	3	
Attempt to murder	0	1	
Irresponsibility	1	2	
Negativism	1	0	
Timidity..	1	1	
Cruelty ..	1	1	
Irritability..	1	0	
Daydreaming	4	1	
Disobedience	0	5	
Destructiveness	1	0	
Erratic behavior	0	1	
Self-consciousness	2	1	
Sensitiveness	1	0	
Carelessness	1	0	
Asocial behavior.	0	1	
Jealousy...	0	1	
Destructiveness	0	3	
Total....	88	124	

\* Adapted from Anderson and Kelley data.

## CHILDREN WHO CANNOT READ

TABLE XXIX—Continued

CAUSE FOR REFERRING	100 READING-DEFECT CASES	CONTROLS	
		100 Institute for Juvenile Research Cases; Satisfactory Readers; C.A., M.A., I.Q., and Sex Held Constant by Pairing with Reading-Defect Cases	
Difficulties in Habits of School Learning			
Retardation at school . . . . .	40	19	
Inability to read . . . . .	9	0	
Lack of concentration . . . . .	7	3	
Lack of interest in school . . . . .	5	3	
Failure to adjust . . . . .	2	5	
Poor memory . . . . .	2	0	
Lack of application . . . . .	1	2	
Grade placement . . . . .	1	0	
Low mentality . . . . .	0	4	
Total . . . . .	67	36	
Difficulties in Habits of Bodily Control			
Enuresis . . . . .	9	2	
Masturbation . . . . .	5	4	
Nervousness . . . . .	12	14	
Speech defect . . . . .	6	5	
Chorea . . . . .	1	0	
Defecation . . . . .	0	1	
Thumb-sucking . . . . .	0	1	
Feeding problem . . . . .	1	3	
Epileptic seizures . . . . .	1	0	
Total . . . . .	35	30	
Miscellaneous			
Physical problems:			
Poor audition . . . . .	1	0	
Undernourishment . . . . .	1	0	
General condition . . . . .	1	8	
Administrative:			
Home placement . . . . .	3	3	
School placement . . . . .	8	4	
Vocational advice . . . . .	0	1	
No home supervision . . . . .	0	1	
No school attendance . . . . .	0	1	
Routine for adoption . . . . .	3	0	
Total . . . . .	17	18	

dreaming, and enuresis. The behavior cases who were satisfactory readers predominated in social problems, such as stealing, incorrigibility, sex offenses, and disobedience.

The reliability of these data is somewhat questionable, as parents and agencies referring children may not mention all the child's problems, or may tend to stress the immediate problem. Inability to read as a cause of referring was mentioned among the poor readers in only nine of the one hundred behavior cases. Inability to read may be one of the prolonged school problems to which parents and agencies become adapted until the child drifts into truancy or incorrigibility, whereupon further study becomes imperative. Speech defects were mentioned with about the same frequency in both groups as a cause of referring, although further study showed significant differences in the number of speech defects in the two groups of children.

Whether the reading defect is caused by unfavorable behavior or personality, or vice versa, is sometimes difficult to determine. A child may be resistant to learning through negativism and unfavorable emotional attitudes. In such a case reading would undoubtedly suffer along with other scholastic achievements. On the other hand, and probably more frequently, a child may develop the emotional and personality problems as a result of failure in learning to read. The emotional attitude may develop through the child's failure and then, in turn, may aggravate still further the retardation in reading.

#### SUMMARY

The following outline is an attempt to list the factors associated with reading disabilities. For convenience, the factors are outlined under various aspects of reading. When the same factor may be viewed from different angles, it is mentioned more than once. We have attempted to list all the observed factors, although only a few aspects of some of them were quantitatively measured. In the following outline we refer to specific reading defects which may occur at any intellectual level.

#### CAUSATIVE FACTORS IN READING DISABILITIES

- I. Difficulties related to the visual aspects of reading
  1. Lack of clear-cut retinal images, due to defects in the refractive mechanisms of the eye, may impede progress in reading.

*Manifestations in reading*

The child shows evidences of eyestrain and confuses similarly shaped letters such as o, e, c, or b, h, n, etc. Reading errors consist of confusion of words such as "oat," "cat," "eat"; or "hand," "band," "hard," etc.

2. Lack of precision in discrimination of complex visual patterns may impede progress in reading. The difficulty in discrimination of patterns in some cases may be associated with hemianopsia, or with injury to optic tracts or cortex. The difficulty in other cases may be due to poor acuity of the peripheral retina so that the child must bring small parts of the pattern successively into foveal vision. The difficulty in still other cases may be due, not to sensory defects, but to difficulties in correlating the visual impressions with language through functional, rather than organic, deviations.

*Manifestations in reading*

The child seems unable to react to words as units. He reads slowly, by spelling out the letters. He sometimes tries to identify patterns by tracing over them with the finger. His reading errors consist of omissions of sounds and filling in words by guessing from one or two recognized letters, thus producing vowel and consonant errors.

3. Lack of precision in discrimination of the spatial orientation of patterns may impede progress in reading. Space perception is usually developed through motor reactions to objects, by looking at, reaching for, or manipulation of the objects in positions up, down, right, left, near, far, etc. A confusion in the directional movements of the hands, or of the hand and eye, may result in confusion of the right or left positions of patterns.

*Manifestations in reading*

The child confuses the patterns which are alike in shape, but which are placed in different positions, as b, d; p, q; u, n; m, w; f, t; "was," "saw"; "on," "no," etc. He confuses the sequence of words and is often a fluent mirror-reader or mirror-writer. He sometimes traces the words or letters with his finger in order to determine their position. He slides a finger along the text to give a cue to direction. His reading errors consist of reversals, repetitions, and sometimes, because of correlating the sequence of sounds with the reversed sequence of letters, of consonant and vowel errors.

**II. Difficulties related to the auditory aspects of reading**

1. Lack of auditory acuity due to partial deafness may impede progress in reading.

*Manifestations in reading*

The child omits endings and non-stressed syllables because he does not hear them. He confuses some of the consonant and vowel sounds.

2. Lack of precision in the discrimination of speech sounds may impede progress in reading. The difficulty in discrimination may be due to a defect in the auditory mechanism for some ranges of pitches and sound qualities. The difficulty is often associated with articulatory speech defects. The articulatory speech defect may result from the lack of precision in auditory discrimination, or if no sensory defect is present, may cause the lack of discrimination. In cases of articulatory defects, the words as presented to a child by himself and by others are different in auditory pattern and yet arouse a common meaning. The two diverse auditory patterns may become so closely associated in the common response as to be inseparable in discrimination.

*Manifestations in reading*

The child confuses words composed of similar sounds, such as "send," "sand"; "bit," "bet"; "cashing," "catching," etc. He has difficulty in forming visual-auditory associations. Reading errors consist of vowel and consonant errors, additions and omissions of sounds.

3. Lack of precision in the discrimination of the temporal sequence of sounds may impede progress in reading. The difficulty in discrimination of sequence of sounds may result from inability to discriminate the separate sounds of the pattern. The child who cannot tell the difference between the separate sounds of the word cannot very well distinguish which sound comes first. The difficulty may be due to poor retention of auditory patterns so that the patterns cannot be held in mind long enough for temporal analysis.

*Manifestations in reading*

The child has difficulty in applying phonics as a method of word-recognition. He may be able to give the separate sounds for each of the letters composing a word but cannot blend the sounds to get the complete word. He often reverses the sequence of sounds, in attempts at blending, as "p-a-r-t-y," blended to make "pottery." Reading errors consist of vowels, consonants, reversals, additions and omissions of sounds.

**III. Difficulties related to the motor aspects of reading**

1. Lack of precision in the motor control of the eyes may impede progress in reading. Children who cannot direct the eyes accurately to the printed words and maintain the motor adjustment for a period

of time usually have difficulty in attending to the visual symbols with sufficient persistence to form the necessary associations.

*Manifestations in reading*

The child frequently loses the place of reading. He skips lines and words. He often follows the text with the finger as a means of keeping the place. Reading errors consist of omissions of words, omissions of sounds, reversals, and repetitions.

2. Lack of precision in the motor control of speech may impede progress in reading. Articulatory speech defects due to cleft palate, partial paralysis, clumsy movements of the speech-motor mechanism, or failure to establish proper motor habits of speech offer an impediment to precise auditory discrimination of speech sounds, and to the formation of speech-reading associations. Stuttering also presents an impediment to reading either as a disruption of motor speech or in association with other motor functions affecting reading.

*Manifestations in reading*

The child confuses words in reading which contain the confused sounds of speech. Frequent errors found in cases of articulatory defects are vowels, consonants, additions and omissions of sounds, and, in cases of stuttering, reversals and repetition.

3. Lack of precision in directional motor responses may impede progress in reading. Left-handed or left-eyed children, whose most facile direction of movement is toward the left rather than toward the right, have to make a motor adjustment which is opposite in direction from that of right-handed or right-eyed children. In trying to imitate the motor patterns set by social custom, left-handed or left-eyed children may become confused in directional responses. Children whose hand-and-eye preferences are mixed may also develop confusion in direction. In those cases in which the directional motor responses are inconsistent, difficulties in discrimination of spatial orientation of patterns may result.

*Manifestations in reading*

The child shows the manifestations described under failure to discriminate the spatial orientation of patterns.

#### IV. Difficulties related to the conceptual aspects of reading

1. Lack of vocabulary may impede progress in reading. Children who have not acquired the verbal symbols which are to be associated with the visual symbols are often delayed in progress in reading.

*Manifestations in reading*

The child fails to comprehend the meaning of the text. He cannot utilize context in giving cues to words since his vocabulary is too meager to suggest possibilities for the unknown words.

2. Lack of facility in the organizations of language may impede prog-

ress in reading. Verbal responses are organized and manipulated in many ways. Sometimes the relationships are simple, such as subject-predicate, adjective-noun, etc. Sometimes the relationships are complex, such as sentences containing dependent clauses, metaphors, contrasts, etc. Some individuals may manipulate a small vocabulary in complex organizations of meanings. Other individuals may manipulate a larger vocabulary in very simple organizations of meanings. Children whose facility in the organizations of language is limited may become confused in reading even though they possess adequate vocabularies.

*Manifestations in reading*

The child skips periods, or inserts pauses at illogical positions in the sentence. He fails to comprehend the meaning of text. The substitutions of words guessed from context are irrelevant or absurd.

V. Difficulties related to methodological aspects of reading

1. Overstress of speed of reading may develop habits which impede progress in reading.

*Manifestations in reading*

The child becomes breathless, excited. Reading errors of all kinds are increased, particularly omissions of sounds and words. Mannerisms to gain time appear, such as clearing voice between words, inserting "ah," repeating portions of sentences before hard words while the words are studied under cover of repetition. Many substitutions and illogical words, guessed hurriedly from context, appear. The child fails to give an accurate account of the content after reading.

2. Overstress of some methods of word-recognition may develop habits which impede progress in reading.

*Manifestations in reading*

Overstress of contextual cues to new words produces improvised or picture reading, substitutions, additions of words, and omissions of words. Overstress of some systems of phonetic analysis, such as explosive sounding (*guh* for *g*, *puh* for *p*, etc.), prevents sound-blending. Phonetic systems of rhyming, such as "cat," "hat," "sat," "pat," etc., may stimulate reversals if the child looks first at the ending to identify the family and then makes a regressive movement to the beginning of the word. Unwise selections of word lists may develop confusions, for example, "can," "cat," "car," "cap," "call," in a list to represent the sound of short *a*. Mechanical emphasis without attention to content may lead the child to ignore meaning.

## VI. Difficulties related to environmental aspects of reading

1. Among the environmental factors which impede progress in reading may be mentioned the following: foreign language, illiterate parents, truancy and poor school attendance, frequent moves from school to school, number of siblings or ordinal position of child among the siblings, etc.

## VII. Difficulties related to emotional aspects of reading

1. Among the personality and emotional factors which may impede progress in reading may be mentioned the following: attentional instability; resistance to reading; fear, timidity, embarrassment; withdrawal, etc. In some cases the emotional factors may be due to constitutional instability or poor habit-training. In other cases the emotional factors may result directly from the failure to learn to read due to other reasons, and then in turn aggravate the disability.

In summarizing the results of the inquiry into the factors which may impede reading, we make the following observations.:

1. No one factor is present for all cases.
2. A number of the factors which were measured quantitatively show statistically valid differences between the reading-defect cases and the controls.
3. Each differentiating factor shows an overlap between the groups of reading-defect cases and controls. Some children who possess the impeding factor had learned to read and some children who do not possess it had failed to learn to read.
4. Factors that are not statistically significant in differentiating the groups seem to be definitely impeding factors in individual cases. For example, foreign language and defects in visual acuity as measured in this study appear with approximately the same frequency in good and poor readers and yet in individual cases offer marked impediments to reading. Refinement of technique of measuring certain qualitative aspects of such factors would probably indicate the conditions under which the factor becomes an impeding one.
5. It is probable that the reading defect is caused by a constellation of factors rather than by one isolated factor. Two children may therefore possess much the same impeding constitutional factor and yet one, through good environmental, methodological, and emotional factors, may overcome the disability, while the other, through poor environmental, methodological, and emotional factors, may become seriously retarded. *The reading defect may result in those cases in which the number or strength of the impeding factors is greater than the number or strength of the facilitating factors.*

## CHAPTER VI

### REMEDIAL INSTRUCTION IN READING: METHODS

Before undertaking remedial instruction in reading we made as thorough analysis of the child's disability as possible from the following data: (1) the educational profile and reading index; (2) the profile of errors; (3) tests of various discriminations involved in reading; and (4) the social, physical, psychological, and psychiatric data which had bearing on the child's reading problem and which were obtained from the clinical record. From these data we listed the factors which seemed to have impeded the child's progress in reading.

#### SELECTION OF REMEDIAL METHODS

The selection of remedial methods was made with a view to overcoming, if possible, the impediments which had prevented the child from learning to read. Drills and devices were arranged to reduce the child's excessive errors in reading, to assist in building up, as far as possible, the discriminations which he failed to make, and to enable him to utilize to the fullest extent the discriminations which he was able to make successfully.

The very complexity of the reading process offered the possibility of a variety of methods of learning. Reading, like thought, may be accomplished in many ways. Just as two individuals may think of the same object in entirely different modes of representation, so may different individuals learn to recognize a printed symbol in entirely different ways. We tried to teach the children who had trouble in learning to read to utilize the possible secondary or vicarious steps in word-recognition which are not usually presented in ordinary instruction. For example, the child whose visual discriminations were precise for small patterns, such as letters, but not for large ones, such as words, was taught by a method which began with the small units and built up the larger ones gradually. The child who had trouble in recognizing the spatial

orientation of patterns was taught to use a manual cue to give the position of the pattern. The child who failed to discriminate precisely the sounds of words was taught the movements of placing the speech organs to obtain the desired sounds and hence to rely on the kinesthetic cues of articulation rather than on audition. The child who had difficulty in recalling an auditory symbol (the word as heard) when presented with a visual symbol (the word as seen) was taught to associate each with the same overt response, and hence to build up the desired associations by a secondary link. The child whose motor control of the eyes was inaccurate for keeping the place of reading was taught to utilize a combination of eye-and-hand movement in developing the desired habit.

We selected methods which required an overt motor response on the part of the child whenever possible, because of the following reasons: (1) The overt motor response is more easily observed by both the teacher and the child than is an ideational response. The child's errors are thus made conspicuous. (2) The overt motor responses are probably a part of the normal reading process, but the movements soon become incipient or fragmentary with unselected children and are not readily observed in the learning process. The usual child in first learning to read may move the lips or point with the finger, but can easily replace the actual movement with an ideational response. The reading-defect cases, on the other hand, may not be able to relinquish the overt responses until a later stage of learning. By exaggerating the movements we may intensify at least one of the components of the learning process. (3) The overt motor responses, when carefully controlled, may assist in discrimination. Many of the reading-defect cases had no observable deficiencies in sensory organs and yet failed to discriminate certain characteristics of sensations, such as the sounds of vowels or the spatial position of patterns. It is probable that, in cases of no sensory defect, the difficulty in discrimination lies in the central co-ordinating mechanisms. By forcing the child to make different motor responses to the different sensory characteristics, and thereby reinforcing the visual and auditory stimuli with discriminable kinesthetic cues, we may ultimately develop more precise discrimination of the visual and

auditory characteristics. (4) The overt motor responses, directed toward the sensory stimuli, may also assist in attention. Attention has been defined as an adjustment of the organism in such a way as to bring the sensory stimuli into the field of greatest vividness or intensity.<sup>1</sup> Unselected children may attend to their reading lessons by a motor adjustment of the eyes toward the words or phrases presented, and an adjustment of the head to hear the teacher's voice. The reading-defect cases may profit from a more widespread motor adjustment. By bringing into play a larger number of movements, all of which are directed toward the visual and auditory stimuli, the child may be able to prolong the attentional adjustment.

#### REMEDIAL TEACHING COMPARED WITH ORDINARY TEACHING OF READING

The remedial teaching of reading is a different problem from the usual teaching of reading to unselected children. The problem of educational instruction in reading is to find the methods which are best adapted to develop skill in reading in the majority of children. The problem of remedial instruction in reading is to find a possible method of learning for those children who have not been able to learn to read by methods adapted to the group. The methods found helpful for reading-defect cases may not be necessary or advisable in ordinary instruction. To the usual child the emphasis on motor response as outlined here, and the placement of the secondary links in the learning process, may be an unnecessary procedure, detracting from the enjoyment through the mechanical devices for recognition of words. The child who has not learned to read, however, and who for the first time finds that he can succeed in reading simple words and sentences, even if by somewhat laborious methods, finds a new interest and enthusiasm for reading, and a new respect for his own capacities. Although some of the methods which we have used stimulate at first a mechanical approach to reading, we have not discarded them on that basis if they brought measurable improvement in reading without sacrificing comprehension. We have proceeded

<sup>1</sup> Carr, *op. cit.*, p. 78.

on the assumptions that, although it is desirable to be a speedy reader, it is better to be a slow reader than a non-reader; that, although it is desirable to be able to recognize large thought units, it is better to read sentences word by word, or words sound by sound, than not to read them at all; that, although it is desirable to obtain meaning without the awareness of mechanics, it is better to get the meaning by mechanical steps than not to get the meaning at all.

Re-examinations of children taught by these methods show that after the initial start in reading is made, the children become more and more like normal readers. The secondary links, while utilized extensively by the children at first, become less in evidence and seem to disappear. Speed of reading develops gradually without specific pressure. Words are grouped into phrases and larger thought units. After remedial training, reading takes on the characteristics of normal performance until the child meets a strange, unfamiliar, or forgotten word. The mechanical links thereupon immediately become evident as the child attacks the word. Incipient tracing or articulatory movements appear until the word is recognized and the child proceeds with the reading. Thus, it appears that the child ultimately builds up an organization of responses which is very similar to the usual reading performance of unselected children, although the underlying steps in building the organization are somewhat different.

#### INDIVIDUAL INSTRUCTION

Besides the special methods used, there are a number of other important factors in the remedial work. Most of the work has been done individually. The teachers applied the methods in rooms in which usually only the teacher and the child were present. The teacher, under such conditions, could study the child more carefully than in a group. The child, also, was relieved of group competitions in reading and distracting social and emotional stimuli. The individual instruction has probably been a factor in the success of the methods. Many of the children, however, had received previous individual help in reading without learning to read. On the other hand, the special methods have

been applied successfully to small groups of reading disability cases. It is probable, however, that both the nature of the methods and the individual instruction have contributed jointly to the effectiveness of the remedial work.

#### MOTIVATION IN REMEDIAL INSTRUCTION

The motivation used was the child's recognition of his own success. We began with easy material so selected from the analysis of the child's difficulties that he would have a high percentage of success. The child, therefore, had the experience of succeeding and obtaining the teacher's approval at the first remedial lesson. Enthusiasm and interest in the work usually followed as a matter of course. Children who were emotionally resistant to reading and who could not be persuaded that they would derive any pleasure from a process so painfully difficult as reading, no matter how fascinating the story or how intriguing the pictures in the books, frequently lost all resistance when confronted with the simple devices in which success was evident. Having succeeded once, effort was usually increased in the ensuing drills. Having won approval through frequent success, the child could recognize his occasional errors without the stigma of failure and with the increased motivation which comes to one who almost succeeds. The remedial work, therefore, was therapeutic emotionally in replacing failure with success and in stimulating a genuine striving for a goal which could often be achieved.

In severe cases, when we were unable to obtain the child's success in the first few sittings, we studied the difficulties encountered, and made a new selection, revision, a simplification of methods. Thus, the motivation of success was a by-product of the methods used. When the method selected brought success, motivation for the work was usually obtained easily. When the method selected brought failure, the child's discouragement, resistance, or lack of interest continued.

#### ATTITUDE OF TEACHER

The attitude of the teachers toward the children was another important factor in the remedial work. The nature of the child's difficulty was explained to the teacher as fully as possible. We at-

tempted to give her the viewpoint that the child's problem was the result of a number of factors, over which he had little control and, hence, for which he should not be blamed. The relationship between behavior difficulties when present and the reading disability was pointed out. When the behavior problems seemed to be the product of the reading disability, we suggested that primary emphasis be placed on the remedial reading treatment, as the behavior problems would perhaps disappear when the reading disability was removed. When the behavior difficulties seemed to be a separate problem, we sent the teacher to the psychiatrist for advice in controlling the child. In each case we tried to arouse the teacher's interest in the problem, and to obtain her full co-operation. We emphasized the patient, repetitive nature of the drill-work to be done and gave suggestions for ways of adding variety without losing the fundamental purposes of the drills. We then outlined fully the remedial program for the child, showing the teacher, step by step, and item by item, the drills which seemed advisable for the child, and the reasons for the selection of those particular drills. Each teacher, therefore, in undertaking the remedial work had an outline of the work to be done, suggestions as to approach in cases in which personality difficulties were present, and as full insight into the child's problem as possible.

#### OUTLINE OF REMEDIAL METHODS

The outline of the remedial methods which were selected to correct the excessive errors is given for the various types of errors. The methods have been adapted and modified from many sources.<sup>1</sup> They are not new in themselves, but their chief value is their specific application to particular difficulties.

*Faulty vowels and consonants.*—Among the causes for faulty vowel and consonant errors are the following: difficulty in the discrimination of specific speech sounds; speech defects; inability

<sup>1</sup> Helpful suggestions have been obtained from the studies on remedial reading, among which may be mentioned the following: G. Fernald and H. Keller, "The Effect of Kinaesthetic Factors in the Development of Word Recognition in Non-Readers," *Journal of Educational Research*, IV (1921), 355-77; Clara Schmitt, "Developmental Alexia," *Elementary School Journal*, XVIII (1918), 680-700, 759-69; W. S. Gray, *Remedial Cases in Reading: Their Diagnosis and Treatment*, "Supplementary Educational Monographs" (Department of Education, University of Chicago, 1922), No. 22; A. I. Gates, *The Improvement of Reading* (Macmillan, 1929).

to associate visual and auditory symbols easily or to retain the associations; failure to observe that words of the same sounds often contain the same letters (whether or not phonics has been definitely taught); and confusion in co-ordinating the temporal sequence of sounds with the right-to-left sequence of letters in a word.

It was necessary, in many cases, to build up, as far as possible, the ability to discriminate speech sounds. We mounted on cards the pictures of several objects beginning with the same consonant sound, or containing the same vowel. The pictures were cut from magazines. The following objects are typical of the selections for a few of the consonants. Italics are used to represent sounds of the letters.

<i>b</i>	baby, boy, bear	<i>s</i>	soap, seed, sailboat
<i>c</i>	cat, coat, cake	<i>t</i>	table, top, tie
<i>d</i>	doll, door, desk	<i>w</i>	window, wagon, watermelon
<i>g</i>	gun, goat, girl	<i>wh</i>	wheel, whip, whistle
<i>m</i>	man, moon, mother	<i>sh</i>	shoe, ship, shell
<i>n</i>	nest, nose, nail	<i>ch</i>	chair, cheese, chick, etc.
<i>p</i>	pie, pig, pencil		

Whenever possible we chose words that contain a vowel immediately after the consonant, as the consonant sound is more easily discriminated in isolation than in blends (e.g., the words, "soap," "seed," "sailboat," formed a better list of objects to emphasize the *s* than the words "spoon," "sled," "store," etc.). We arranged cards also for the vowels, for example:

<i>a</i>	cat, man, lamp	<i>o</i>	bottle, box, top
<i>ä</i>	table, cake, gate	<i>ö</i>	boat, coal, soap
<i>ɛ</i>	egg, red, hen	<i>ɪ</i>	pig, milk, ship
<i>ɛ</i>	sheep, seed, beet	<i>ɪ</i>	kite, dime, fire, etc.

In building up the discrimination, we began with unlike sounds, for example, *m* compared with *s*, a very easy discrimination for most of the children to make. The cards for *m* and *s* were placed in a row in mixed order, as:

soap, man, seed, sailboat, moon, mother

The child was instructed to articulate clearly the *s* and then name the pictured object. If the name of the object began with *s*, the child was asked to retain the card. The procedure was followed

as in this example. Child: "s-soap, yes, 'soap' sounds like *s*"; "s-man, no, 'man' doesn't sound like *s*," etc. If the child succeeded with this drill, and with several other widely unlike sounds, we proceeded to the more difficult discriminations, as:

*s, sh*      soap, shoe, seed, sheep, sailboat, shell  
*or b, p*      baby, boy, pie, pig, bear, pencil  
*or m, n*      man, nest, mother, nose, nail, moon

Here the children were likely to have difficulty. The child might say, "s-shoe, yes, 'shoe' sounds like *s*, or *p*-boy, yes, that's alike." The most frequently failed discriminations were *s, sh; ch, sh; m, n; b, p; ch, j; k, g; w, wh; d, t*, etc. Sometimes the child failed to differentiate the initial sound, and gave "n-gun" instead of "g-gun." In such cases drill was given by asking the child to get ready to say "gun," but to stop before all the word was said. After lists were made of the child's confusions, we attempted to develop the discrimination of the sounds, by the articulatory movements. *M* is made with the mouth closed; *n* with the mouth opened. *S* is made with a little groove in the tongue for the air to hiss through; *sh* is made with a broader groove. *B* and *p* are different in that the vocal cords vibrate in sounding *b* but not *p*. The hand held to the throat feels a distinct purr of the vocal vibration in *b* but none in *p*. (*Caution*: It is necessary to give accurate sounds and to insist that the child respond with accurate sounds, i.e., a clear-cut consonant without being followed by the vowel, *uh*—not *buh* or *puh*.) In cases where there was an articulatory speech defect, speech-training accompanied the remedial-reading work. In order to obtain the correct placement of the speech organs in specific sounds, devices such as those given in handbooks on speech correction were used.

The drills in sound discrimination were varied by asking the child to give words beginning with certain sounds. Many children had decided difficulty in complying with this request. It seemed impossible at first for some children to think of illustrative words. The teacher tried to suggest words, for example, "Don't you hear that these words begin with *m*: 'm-mother,' 'm-man,' 'm-moon'?" Now you try to think of some words that begin with *m*." One child responded 'm-father,' 'm-son,' etc. It was necessary to work

patiently with this boy by the card-sorting drills for several days before he could succeed in identifying the initial sounds of words and in suggesting words containing designated sounds. In these drills no mention was made of letters. The entire training, so far, was in discrimination of sounds from hearing and articulating them.

The drills for vowels followed the same procedures. The vowel discriminations were somewhat more difficult for the children than the consonants because the vowels are usually found in the middle of words and the child had to learn to ignore the initial sound in listening for the vowel. The vowels are formed by shaping the oral cavity so that the quality of the voice is modified. It seems more difficult for the child to differentiate the kinesthetic cues obtained from the vowel positions than from the consonants where there is a definite position to be taken with tongue, teeth, palate, etc. We usually began the drills with unlike vowel sounds for discrimination, such as *ē* and *ō*:

sheep, boat, soap, seed, coal, beet

It was usually easy for children both to hear and to feel the different qualities of the long *e* and the long *o*.

Proceeding from the easily distinguished sounds to the more difficult, we noted the particular confusions of each child. The most difficult discriminations in vowels were between the short sounds, *ɪ*, *ɛ*, and *ə*.

The child was taught how to shape the oral cavity to obtain the proper vowel. For example, in saying *ə* the mouth is opened a little more widely than in saying *ɛ*. A mirror in which the child looked at the shape of his own oral cavity while comparing it with the teacher's was helpful.

The associations between the letters and their most frequent sounds were established next. In cases where there was difficulty in retention of the associations, manual tracing was introduced as a reinforcement. The child traced over a model of the letter, prepared by the teacher, while simultaneously articulating the sound. The process was repeated three or four times, and the letters were presented for recall until the sounds could be identified by sight without tracing. Usually five or six consonant sounds could

be learned at one sitting. After the child retained the associations between five or six of the consonant letters and their sounds, we presented one of the short vowels, usually *a*. The child then combined the vowel and consonants in building simple words. The vowels were easily blended with consonants if the vowel preceded the consonants, as in the list "at," "am," "ask," "and," etc. We later presented lists in which the consonant preceded the vowel, as "cat," "can," "cap," "ran," "rat," etc. From this point on, the remedial work consisted of developing the recognition of words from their sound components. We usually proceeded systematically, by easy stages, passing rapidly through the drills which were easy for an individual and spending all the time necessary when difficulties were encountered at any stage. Often we had to give special drills in blending the sounds of words to make the word. Thus, some children could sound the individual letters of the word *p-t-g* but could not blend the sounds to give the complete word. For such children we devised games in which words were sounded orally, progressing from two-sound combinations, such as *m-e*, to three- and four-sound combinations, such as *sh-i-p*, *t-r-a-p*, etc. The words learned were listed systematically, traced manually, and reviewed frequently.

The sounding-tracing method is illustrated by the following example: The teacher wrote the word to be learned in large handwriting on a piece of paper. She said to the child, "See this word? This word is man. Say man. Now let me see how slowly you can say man, like this, *m-a-n*. Now I want you to do two things at the same time. Take your pencil and trace over this word while you say *m-a-n*, slowly. Be sure to trace quickly enough and speak slowly enough that you will come out just even." The sounding consisted simply of articulating the word distinctly and slowly enough for the sequence of sounds to become evident. We tried to teach the child the trick of letting the voice slide from one sound to the next so that the word was pronounced in a unified fashion. Often it was not necessary for the child to say the word again after sounding it, as the sounding became simply a slow, distinct articulation of the word. By use of the sounding-tracing

method, we tried to combine the separate components of the word into an organized unit. The tracing united the letters as the pencil was not lifted until the end of the word. The sounding, by slow articulation, united the sounds as the voice did not stop until reaching the final sound.

In order to allow duplication of our methods, illustrative samples of the words in the lists are given below, although we felt that the manual and articulatory methods of learning the words were probably more important than the arrangement of the lists. It was not our purpose to present a phonetic system, and probably other systems will work equally well if logically followed. The following steps are arranged in the order in which we usually proceeded:

Step I. Three sounds, including one short vowel:

man	bed	pig	hot	sun
cat	beg	did	top	but
can	let	him	box	bug
rat	hen	sit	not	run
had, etc.	get, etc.	win, etc.	nod, etc.	rug, etc.

Step II. Differentiation of short vowels:

hit	him	bug	bat
hat	hem	big	bit
hot	ham	bag	bet
hut	hum	beg	but, etc.

Step III. Four sounds, including one short vowel, or three sounds with double consonants, ss, ll, etc.

sand	best	hill	pond	dust
fast	bell	milk	doll	hunt
flag	went	spin	stop	jump
pass	stem	will	trot	just
past, etc.	sled, etc.	wind, etc.	from, etc.	dull, etc.

Step IV. Five sounds, including one short vowel, or three or four sounds with sh, ch, ck, ng, th, wh, etc.:

crash	shed	stick	chop	shut
that	spend	sing	block	blush
strap	chest	this	shot	chunk
black	then	which	chops	pluck
shall, etc.	when, etc.	chick, etc.	spots, etc.	stuck, etc.

Step V. Syllables with the short vowels; final syllable -ing, -er, -le, and -y:

basket	standing	apple	better	kitty
cannot	spending	little	river	Betty
until, etc.	running, etc.	bottle, etc.	under, etc.	Sally, etc.

## Step VI. Long vowels with the final e, long e, o, and y in short words, and ee:

cake	she	bite	my	note	go	tube	sheep
ate	he	time	sky	hope	so	rude	tree
made	we	like	by	rode	no, etc.	flute	see
make	be	kite	try	home		plume	three
gave, etc.	me, etc.	side, etc.	spy, etc.	spoke, etc.		tune, etc.	green, etc.

## Step VII. Vowels formed by two or more letters:

day	paid	boat	night	soon
say	pail	soap	sigh	spoon
play	maid	goat	sight	boot
may, etc.	rain, etc.	road, etc.	fight, etc.	room, etc.
each	cow	out	book	saw new
eat	now	house	look	awl blew
please	town	mouse	good	lawn flew
reach, etc.	down, etc.	round, etc.	took, etc.	shawl, etc. chew, etc.
blow	ought	oil	boy	head
grow	bought	boil	toy	bread
flow	thought	join	oyster	deaf
show, etc.	brought, etc.	coin, etc.	joy, etc.	health, etc.

## Step VIII. Vowels modified by a consonant or consonants:

art	girl	burn	her
star	first	church	stern
farm	bird	turn	fern
barn, etc.	dirt, etc.	curl, etc.	term, etc.
or	water	all	find child
for	was	tall	wild
horn	watch	talk	mild, etc.
morning, etc.	want, etc.	walk, etc.	sold, etc.

## Step IX. Vowel-discrimination drills:

ran	new	bad	saw	tack
rain	now	bed	soap	talk
rid	night	beed	seed	take
ride	nip	bait	sad	tick
rode	nap	bit	same	tuck
right	need	bite	sack	took
raw	neat	bright	suck	toad
road	noon	brought	sick	tight
read	name	burn	sir	tart
raid	nest	barn	sort	turn, etc.
rude, etc.	nail, etc.	born, etc.	sought, etc.	

## Step X. Consonant variants:

cent	ginger	knot	write	rough
fence	gentle	knife	wrap	tough
city	hinge	know	wren	enough
cinder, etc.	edge, etc.	knee, etc.	wrote, etc.	laugh, etc.

## Step XI. Vowel variants:

ough as in through  
ough as in though

*ew as in sew*  
*ou as in you*  
*ea as in great, etc.*

**Step XII. Syllables with frequent suffixes and prefixes:**

en-	ex-	-er	-ness
in-	sup-	-or	-ful
un-	re-	-est	-tion
or-	pro-, etc.	-ed	-tious, etc.

**Step XIII. Complex syllables:**

attention	additional
complicate	accomplishment
containing	intensive, etc.

After the child had traced the words of a list written on paper while articulating the words slowly, he was presented with the words printed on cards for recall. No flashing of cards or pressure for speed was given, but, on the other hand, the child was always encouraged to articulate the separate sounds and blend them, whenever unable to recognize the word as a unit. The variability of the children in their immediate recognition of words was constantly evident. A word might be recognized immediately as a unit at one sitting and yet have to be attacked phonetically as a totally strange word at the next. The phonetic method gave the children a feeling of mastery over the insecurity of their recognition. As one child said, "Sometimes it just flashes out at me what that word is but other times I can't remember it. But I can always go back and get the sounds now."

As a variation of the tracing method, a "sound-dictation" method was substituted. The child wrote the words as the teacher dictated the sounds, and then re-read the list. The writing proved to be as helpful as the tracing, and some of the children liked to write better than to trace. The words were presented in such fashion as this: "These words are all *d* words. I'll say the word first so you will know what it is; then I'll say it very slowly so that you can hear the separate sounds; then you say it slowly like I did, while you write the letters for each sound. 'Man,' *m-d-n*. Now you write and say *m-d-n*."

Children who could read with second- or third-grade achievement were usually able to pass through the drills rapidly. They could already recognize many of the words in the lists and did not need to trace those already known. They had difficulty, however,

with some of the steps, such as II or IX, unless a review of the previous ones was given.

As soon as the child had a vocabulary of a number of words he was given stories written in simple phonetic language. The non-phonetic words of primer vocabulary were added gradually, such as "you," "the," "to," "were," "are," "mother," "father," "again," "one," "said," "they," "two," "would," etc. The non-phonetic words were learned by tracing and articulating. The known sounds were pointed out, as *m*, *th*, and *r* in "mother," *w* and *r* in "were," etc.

Samples of the phonetic stories are given below to show the possibility of providing reading material for the children so that they could easily read all the words with even a limited phonetic knowledge.

This story was written for a twelve-year-old boy of average intelligence who had been a total non-reader but had completed sections I, II, III, IV, and V of the word lists in twelve hours of remedial work. Besides the words of the lists, he was taught "the," "he," "father," "have," "to," and "put" by tracing. With this foundation he read the following story with no assistance and derived a great deal of pleasure from the process. He could thereafter answer questions over the content in minute detail.

In the summer Bill must get up at six.

He sets the clock for six.

He gets up when it rings.

Bill must bring in the milk.

He must get the eggs.

He must help his father.

After dinner he rests.

He sits in the swing.

If it is hot, he swims.

He swims in the river.

He can jump from the plan

He can swim on his back.

It is fun to swim.

Bill has a pal.

His pal is Tom.

Bill and Tom have a camp.

The tent is on a big hill.

Bill's father let him have the tent.  
In the tent is a box for pots and pans.  
Back of the tent is a spring.  
Bill and Tom have supper at the camp.  
Tom brings a bucket of milk.  
Bill brings ham and eggs.  
After supper Tom tells of his trip last summer.  
He went to the Grand Canyon with his father.  
He went into the canyon.  
The river is under the big red cliffs.

The sun sinks in the west.  
Bill scrubs the pots and pans.  
He puts them back in the box.  
Tom gets wet sand from the river.  
He puts the sand on the ashes.

This story, although limited to phonetic words containing the short vowels, deals with events which are interesting to a twelve-year-old boy. The literary quality of stories written in such limited vocabulary is, of course, questionable. When both short and long vowels are available, however, the variety of stories which can be written for the children increases greatly, as in the following sample. The child for whom this story was written had progressed through Step V and had in addition the long-*e* sound formed by ee. She also had learned the non-phonetic word "they."

Ann has seven sheep on a green hill.  
They nibble the sweet grass.  
They jump and run on the hilltop.  
They sleep under the trees.

After both long and short vowels have been added with a larger number of non-phonetic words, the stories can be made much more complicated. The following sample necessitates Steps I-VI and the words "father," "mother," "they," "to," and "was."

Jack spent a summer at a lake  
in Wisconsin.  
He drove with his father and mother  
and sister Jane.  
When the traffic was not bad,  
Jack's father let him drive.  
They drove three hundred miles.

When they came to the lake they rented  
a cabin.

The cabin was white with green  
trimmings.

The sun on the lake was hot, but  
the cabin was set back  
in the shade of the trees.

Such fun! To spend a summer by the lake.

To swim, to dive!  
To fish in the lake!  
To ride on the waves!  
To take a nap under the trees!  
To make a fire on the sand!  
To tramp up the hills!

From this stage on, and while the two-letter vowels were being learned, the children were given the ordinary primers and first readers available in the schools. With this background the non-phonetic words could often be obtained by context. When the children were able to read all the words of a sentence except one or two, the meaning helped in completing the sentence. When the children could read only one or two words in a sentence, however, they could not very well utilize context since the context was too fragmentary to suggest the meaning. The children who had learned the short vowels could complete the following sentence easily (in a story of an engine).

“They fill my tank with *w*\_\_\_\_.” The word “water” is easily obtained from the initial sound *w*, which is recognized, and from the knowledge of the ways of engines. Our children, however, while filling in the word easily, often did not later recognize the word if it was presented in isolation. They utilized context in reading, but the words read through context were usually not fixated until special drill had been given.

*Reversals.*—Among the causes of reversals in reading may be mentioned the following: confused directional preference which impedes the discrimination of orientation of patterns; difficulty in discrimination of complex patterns; difficulty in discrimination of the temporal sequence of speech sounds; difficulty in co-ordinating the temporal sequence of sounds with the directional sequence

of printed words; difficulty in motor precision of eye movements; and failure to observe that reading has a definite directional sequence.

In assisting the child to overcome the confusion we found it necessary to give him a definite motor cue to direction, which he utilized in periods of confusion. To most teachers the sequence of reading seems so very simple and obvious as to be taken for granted. The teacher, therefore, should first realize the child's difficulty and how seriously the failure to discriminate the directional sequence of reading may affect reading. To illustrate the importance of sequence, the following sentence is re-written by transposing a few letters and by rearranging the series of letters within a few words. Note the effect:

A boy saw a dog on the street.  
A doy was a god no the treest.

The difficulty in recognition of the transposed words immediately becomes apparent. If the confusion includes not only the orientation of letters and the sequence of letters within words, but also the sequence of words, the problem becomes increasingly severe.

The tracing-sounding method described for vowel and consonant errors was helpful in overcoming reversals. The recognition of words by small units allowed the child to proceed through the word by tracing from left to right while articulating the sound in correct temporal sequence. The manual response assisted in the discrimination of the orientation of the visual patterns, and the slow articulatory response assisted in the discrimination of the temporal sequence of sounds.

The letters b, d; p, q; u, n; m, w; f, t, etc., were traced by writing the script form of the letter over the printed form. A written b will fit nicely over a printed b but will not fit over a printed d. The movements of writing b and d are sufficiently different for the child to identify the movements of writing even if unable to identify the orientation of the printed symbol. By superimposing the movements of writing over the printed letters until one "fits," the child learned to identify the printed letters. Cursive writing was

more helpful than manuscript writing for this drill, as the movements in cursive writing seemed more easily distinguished than the movements of writing the manuscript letters.

In order to develop a consistent direction of reading words, the child was asked to follow with a pencil, or finger the letters within a word and the line of words along the page. The child first practiced sliding the pencil along to keep place as the teacher read a story aloud slowly. A sliding motion was encouraged, not simply the motion of pointing from word to word. If the child's motor control was inaccurate for the process, the stories were typed with an inch space between lines and the child actually drew a line on the paper below the typewritten words as he read them.

In many cases we had the child write the words as he read them slowly. The stories for this drill were typewritten with one space between each letter in the words, with four spaces between words in a sentence, and with five or six spaces between lines. In this form of typing, plenty of space was left on the paper for the child to write each word directly below the typewritten word as he read. Words frequently confused were presented in sentences for writing while reading, as in the following examples:

The boy saw the dog.

The boy was good.

He felt sad.

He left home.

The boys had no caps.

The boys had on caps.

In cases of extreme reversal we prepared large cards which contained the words "was," "saw"; "on," "no," etc., printed in very large type, and also raised in pattern by the dots of a Braille writer. With eyes closed, the child moved the hand over the Braille dots while articulating the words until he could differentiate the words by touch. Then he looked at the printed words while feeling the raised dots. We did not use the conventional Braille cell but followed the outline of the printed type with the row of raised dots. The additional cutaneous cue to the words was helpful in correcting the words most frequently confused.

The motor aid to direction by sliding a finger or pencil along the text is sometimes held in disrepute by teachers, perhaps due to the fact that, in looking over a class of children, they observe that the good readers show little tendency to point while the poor readers often finger the words. The teacher, in trying to make the poor readers like the good readers, may prohibit a helpful cue to direction which would otherwise be spontaneously adopted. Occasionally we found it necessary to assure the children that we really wished them to use their hands. Even then, a few children protested doubtfully and said, "But I don't want to be a baby." When resistance to the use of the finger was present, we suggested that the child use an orange-wood stick or a pencil. If there was still resistance, we did not insist but simply slid the pencil along the text for the child, so that he could follow the cue thus given. After a while, when we left off the cue, the children often spontaneously took up the pencil and continued by themselves. A tabulation of errors made on comparable pages read with and without the manual cue in almost all cases of reversal confusion resulted in much greater accuracy with the manual cue. The efficacy of the device in preventing errors was thus easily demonstrated to the child.

In using the manual cue to direction we selected the child's more facile hand as nearly as could be determined. In cases giving history of change of handedness, we shifted back to the left hand those children who retained greater facility with the left hand in spite of the change. We did not attempt to shift back to the left hand the children who had developed greater facility with the right hand even though they had been left handed originally. In cases of equal facility of the two hands we usually chose the hand corresponding to the preferred eye.

*Addition of sounds.*—Among the causes for the insertion of extra sounds in words are: failure to discriminate the blends of consonants; speech defects; failure to discriminate the word form accurately; previous errors which give the set toward plurals, or participles, etc.

The most frequently inserted sounds were found to be *r* and *l*. The sounds *r* and *l* are blended with a large number of consonants.

The position of the speech organs in the formation of *r* and *l* is one which may readily be assumed after a large number of consonants, for example, *bl*, *br*, *cl*, *cr*, *fl*, *fr*, *gl*, *gr*, etc. Some of the other consonants cannot be articulated easily in succession without inserting a vowel between, for example, *bg*, *fb*, etc. The tendency to insert the *r* and *l* sounds in reading may be due partly to the ease with which the sounds may be combined with others, and partly to the many words which are therefore similar except for the presence or absence of the sounds.

In cases of persistent insertion of the *r* and *l* sounds, we gave drills on lists of words which were alike except for the presence of *r* and *l*. A list of words illustrating the presence or absence of *r* is as follows:

tack, track	dug, drug
tap, trap	tuck, truck
camp, cramp	bake, brake
tick, trick	fame, frame
dip, drip	dive, drive, etc.

A list of words illustrating the presence or absence of *l* is as follows:

back, black	sip, slip
cap, clap	fit, flit
fat, flat	cub, club
pan, plan	gaze, glaze
sit, slit	side, slide, etc.

A preliminary drill was given to train the child to listen for the *r* or *l* sound. The words of the *r* list, for example, were printed on cards and mixed so that the words with and without *r* did not appear in a regular sequence. The teacher read the word on the first card in the pack; the child listened but did not see the card. He then indicated whether or not he thought the word contained the *r* sound. The card was given to him to check his response by seeing whether the letter *r* was actually present. When the child was able to choose, from hearing the words, those which contained the *r*, he was given the pack of cards to read, and a score was kept of the number of words correctly given at each trial until the list could be given without error. The same method was used for the

insertion of *l*, or any special sound or syllable which the individual inserted. Typical lists of frequently confused words follow:

long, along	wet, went
round, around	hut, hunt, etc.
go, ago	puss, pussy
way, away, etc.	wind, windy
farm, farming	sun, sunny
run, running	pup, puppy, etc.
go, going	sand, stand
come, coming, etc.	sick, stick
bad, band	sill, still
pod, pond	sore, store
bed, bend	sack, stack, etc.

In cases where the insertion was due to a previous error which altered the meaning so that a plural noun was indicated, or a change of verb form was necessary, no special drill was given for the insertion of the -s or -ing, -ed, etc. The correction of the previous error was found to eliminate automatically those insertions due to mistaken meaning.

*Omission of sounds.*—Among the causes for the omission of sounds are: speech defects of sound omissions; difficulty in discrimination of complex visual patterns so that the child recognizes a smaller unit within a word and omits the rest of the word; overstress of speed so that the child skims the text omitting endings and parts of words.

Often the omission of sounds was corrected simultaneously with vowel and consonant errors by the sounding-tracing method. Little opportunity for omission of sounds is given by this method as the articulation continues simultaneously with the tracing until the end of the word is reached.

Omission of sounds due to speech defects were treated by giving speech-training in conjunction with the remedial-reading instruction. The children who said "tan up" for "stand up," for example, in the process of speech correction learned to articulate the sound blends and could be taught thereafter to apply the blends to reading, by the sounding-tracing method.

The children who selected only a small portion of the word in reading and seemed oblivious to the other parts of the word pat-

tern were given drills in dividing words into small, easily handled units, such as syllables in polysyllabic words, or such as the isolated sound units in monosyllabic words. The small portions of the word were then combined to make the complete word.

In cases in which the child's omissions seemed caused by undue pressure for speed, we encouraged a slower rate of reading for a while, until accuracy was obtained.

*Substitution of words.*—Substitutions of words having no similarity to the text, except probably a logical one, seemed to result in cases in which the child had no method of word analysis but simply made up a story of his own from the pictures in the book, or by filling in the meaning from one or two recognized words. The use of context in identifying new words is a valuable method, and some substitution indicates that the child is thinking of the meaning of the story. Context cannot be used successfully as a method of word-recognition, however, unless the child can recognize correctly the majority of the words of the sentence. In cases where the child can recognize only one or two words in the sentence, the context is so fragmentary that it is almost impossible to complete the sentence by a logical process. As an illustration take the following sample in which unknown words are left blank:

*Text:* A boy had a dog.

The dog ran into the woods.

**Meaning**

may be

obtained

from

context: A boy \_\_\_\_\_ a dog.

The dog ran \_\_\_\_\_ the woods.

**Context**

too fragmentary

to obtain

meaning: A \_\_\_\_\_ a \_\_\_\_\_.

The \_\_\_\_\_ ran \_\_\_\_\_ the \_\_\_\_\_.

Many of our children, whose reading vocabulary limited their contextual cues to the extent of the last example, tried conscientiously to fill in the unknown words with meaningful substitutions.

To correct excessive substitution, we gave the child easier reading material, if possible, until the number of substitutions was automatically reduced by increasing the context of recognized words. If the child's vocabulary was not adequate for him to read any available books without excessive substitution, we built up his reading vocabulary by the previously described methods, and gave him phonetic stories to read.

*Repetition of words.*—Repetition often resulted from other errors which disrupted the meaning of the passage, so that the child re-read a portion of the text in an attempt to discover the error. Repetition sometimes was habitual without relationship to errors. At other times repetition occurred with excessive reversals and, in itself, seemed to be a type of regressive movement. Repetition sometimes appeared to be a device to gain time in the case of words which were not immediately recognized. For example:

*Text:* The dog ran into the woods.

*Read:* The dog ran into the, ah, into the, ah, the, into the, etc.

Excessive repetition was analyzed to determine which of the foregoing causes seemed to be present in the individual's case. In cases in which other disrupting errors caused the repetition, no specific drill was given as the repetition automatically decreased with the remedial treatment of the other excessive errors. In cases in which repetition was habitual, we tried to make the habit conspicuous to the child so that he could avoid it knowingly. A good drill for overcoming habitual repetition was concert reading of teacher and child. As the teacher and child read the passage slowly aloud together, the teacher's voice continued to the following words, while the child's voice repeated parts of the text. The child's repetitions, therefore, caused an unpleasant discord or jar in the concert reading. This method seemed effective in eliminating the repetition as the child was immediately aware of the discord and tried to avoid it. After a period of simultaneous reading the child read a passage alone. Repetitions were counted, and the child attempted to reduce the number from day to day.

Repetitions which accompanied reversals were often eliminated by the process of manual guidance in the direction of reading.

Repetitions occurring as a stall for time to recognize unknown words were eliminated by giving the child a method of word analysis so that the unknown word could be attacked.

*Addition of words.*—Addition of words, such as adjectives before nouns, adverbs inserted with a verb, sentences joined by conjunctions, etc., often did not seriously disrupt the meaning of the text. Such insertion seemed to result in cases where the child was fully aware of the meaning and was adding to the content from his own knowledge. We did not attempt to overcome the additions which were present when the child was reading fluently and with comprehension. When the meaning was confused because of insertions of words, however, we gave drill to prevent the insertions by typewriting the sentence twice, once as given in the text, and again as given by the child. The child read both sentences and was asked to point out the difference in words and in meaning. Addition of words was found to be the least differentiating of any of the error-types in separating the good and poor readers.

*Omission of words.*—Omission of words often occurred as a result of an attempt at speed. In cases of excessive word-omissions, a slower rate of reading was found to be helpful in eliminating the error. The word-omissions were not considered important or to require remedial instruction when the meaning was not disrupted and answers to questions dealing with content could be given accurately. Superior, fluent readers tend to omit words which do not contribute greatly to content. When words were omitted irrespective of meaning, however, special drills were given to overcome the errors. The concert-reading method described for overcoming repetition was found to assist greatly in eliminating the errors of word-omission.

Line-skipping was considered a serious type of word-omission, and remedial methods were directed to overcome the tendency whenever it occurred. In cases where the child did not discover the error through the break in the meaning, we re-wrote stories on a typewriter with wide spaces between lines. The spaces were gradually reduced to the usual amount. We also found it helpful for the child to draw lines with a pencil under the lines of print as

he read typewritten stories. He was therefore able to see plainly which line he had already read on his return sweep to the next line.

The remedial methods as here described were modified to meet the needs of each individual. A child who could read with second- or third-grade achievement did not need to be presented with all the drills given to the total non-readers. The lists of drill words in such cases were modified to give a specific attack at the child's errors. In order to obtain the drill lists of words, we tabulated the child's reading errors in the book selected. About ten minutes daily spent in recording the errors as the child read aloud gave a valuable source of words. The words missed and the child's mispronunciations were both recorded. The words were then printed with a rubber-stamp outfit on cards and the cards were sorted into lists illustrating the various steps of procedure—short vowels, long vowels, consonants, reversed words, sound-additions, etc. The words were then learned by the sounding-tracing method until the cards could be read easily, first by sounding the words, later by sight. By this method the drill lists were made directly from the child's own errors. Although the method was somewhat laborious, the results paid for the time spent since the child directly attacked the very words which he could not read and which were needed in the vocabulary of the book attempted.

The choice of books was an important part of the remedial program. The book selected for each child was graded at the level of his reading achievement. For example, an eighth-grade boy who read with third-grade achievement was given a book of third-grade difficulty. It was not always easy to find books of suitable subject matter for older children of limited reading vocabulary. A search was made through libraries, and the most appropriate books selected with reference to the child's interests. For the children who could not read from primers, we wrote our own phonetic stories as previously described, using the vocabulary of the drill lists.

In remedial instruction we found the following materials helpful: a typewriter (with giant primer type), a rubber-stamp outfit containing both capitals and lower-case letters, reams of scratch

paper for word-tracing, old primers which could be cut up and in which the children could draw lines and trace words with pencil, magazines from which to cut pictures, and a library of children's books.

At all times in the remedial work we checked the child's comprehension of the material read, by questions and corrective devices. Although our methods stressed the mechanics of word-recognition, we utilized the recognition of words, not as an end in itself, but as a means to accomplish the final goal of reading, i.e., the comprehension of meaning. Our reading defect cases, as indicated by their reading indices, were children who had mental ages, chronological maturity, and arithmetic achievement in advance of their reading achievement. The majority of the children, given the mechanics of reading, could get the meaning of the passage with little difficulty. Often we had to define the words in the word lists. The children who had not been able to read usually possessed inferior vocabularies and used simple, incomplete, or brief sentences. Any obscurity in the meaning of the text was always explained carefully to the child. Usually comprehension of the text developed with practice in reading as the child progressed from the simple to the harder books. In cases of specific difficulty with comprehension, in spite of adequate mechanics, we gave many drills, devised to increase vocabulary and language usage. We had the child list synonyms, or opposites, re-write sentences, using totally different words to express the same thought, etc. We gave drills in having the child dictate stories from pictures and then read the story after it had been typewritten in both easy and difficult versions. We constantly devised ways of utilizing, in meaningful and purposive channels, the words which the child learned to recognize by the motor methods. The work, as here described, has as its goal the development of the ability ultimately to read, as does a normal reader, comprehendingly, accurately, pleasurabley, and with as little effort as possible. The mechanical steps are inserted only as a possible means to this end for those children who deviate constitutionally or functionally in such a way as to fail to learn to read by less laborious methods. That, in a large number of cases, we actually achieved the goal will be demonstrated in the following chapter.

## CHAPTER VII

### REMEDIAL INSTRUCTION IN READING: RESULTS

Two hundred and thirty-five children have received varying amounts of remedial instruction in reading according to the methods outlined in the previous chapter. The children were divided into groups which will be described in turn, with the conditions and results of the treatment.

Group A consists of eighty-nine children who received training under close supervision. Thirty-five adults gave the instruction, each adult working with several cases individually. In addition to the writer's laboratory assistants, the adults consisted of psychologists, principals and supervisors of schools, graduate students in universities, vocational advisers, and special teachers of reading. Many of these persons worked directly with the particular children whom they had referred to the clinic, and were interested in the experiment because of its bearing on their own fields of service. Others volunteered to assist in the experiment in order to enlarge their experience with children having special disabilities. All the teachers followed the directions for the remedial methods carefully and carried on the treatment either at the laboratories of the Institute for Juvenile Research under frequent observation or at their own schools, returning to the laboratories for repeated conferences and demonstration lessons. The work done with children of Group A was therefore intensive, carefully controlled, and done by persons of superior training and background. In these cases the remedial work was given usually in hour or half-hour sittings at regular intervals.

Group B consists of fifty children who received remedial instruction in reading at their schools from their teachers. Each child's teacher was invited to come to the Institute for Juvenile Research and have a conference to discuss findings in the diagnostic reading tests. The teachers who were interested responded

to the invitation. The child's reading disability was then explained to the teacher and suggestions for the remedial instruction were made. Many of the teachers had been helping the children with reading but were at a loss as to how to proceed and were glad to receive specific suggestions. Fifty of the teachers who came for the conferences volunteered to give the suggested remedial training as systematically as possible, helping the child before or after school, or during free periods. It was not always possible to control carefully the work done by these fifty teachers as some of them could not return for more than one or two conferences, and others found it impossible to follow any regular schedule of teaching. The remedial work done with Group B, therefore, was not so intensive as that of Group A, and was subjected to a greater variety of disrupting influences. The teachers who volunteered to do the special work were, as a whole, conscientious in applying the methods and were probably somewhat superior to unselected teachers, as evidenced by their interest and enthusiasm in a teaching project which required time and effort outside of their daily program. The remedial work with Group B was usually given in fifteen-, twenty-, or thirty-minute sittings at varying periods.

Group C consists of fifty children who received no remedial instruction in reading. They were recalled to the Institute for Juvenile Research and retested after periods of time comparable with Groups A and B, in order to determine the progress made by reading-disability cases during ordinary school instruction without specific treatment. Group C, therefore, gives a basis for the comparison of the effectiveness of the remedial-reading instruction with ordinary school instruction in cases of reading disability.

The results of the tests and retests of Groups A, B, and C are given in Tables XXX, XXXI, and XXXII. The tables show the children's ages, intelligence quotients, reading achievements and reading indices, at the first and last tests, the number of months elapsing between examinations and the approximate number of hours of remedial instruction as determined from the teachers' reports. Each item was averaged for the three groups, and also for three intelligence divisions of each group, superior, average, and inferior. An inspection of the tables shows that Groups A and B

TABLE XXX

## GROUP A: CASES TRAINED UNDER CLOSE SUPERVISION

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEV- EMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST	APPROX- IMATE HOURS' TREAT- MENT
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained		
1.....	14-1	98	3.4	5.5	+2.1	0.37	0.56	+0.19	0	64
2.....	15-5	94	8.0	9.0	1.0	.77	0.84	.07	7	7
3.....	10-11	83	1.2	2.3	1.1	.32	0.50	.24	3	15
4.....	9-5	106	2.0	3.9	1.9	.48	0.72	.24	12	100
5.....	6-9	116	1.2	1.9	0.7	.55	0.67	.12	5	15
6.....	9-5	96	1.6	4.2	2.6	.41	0.76	.35	10	80
7.....	10-3	97	3.4	5.8	2.4	.79	1.00	.21	14	36
8.....	9-6	104	2.2	3.6	1.4	.52	0.73	.21	12	20
9.....	10-5	114	2.7	3.9	1.2	.47	0.62	.15	6	16
10.....	12-2	74	1.5	3.9	2.4	.28	0.60	.32	16	48
11.....	12-7	94	1.2	2.6	1.4	.18	0.37	.19	3	24
12.....	10-3	106	2.5	4.2	1.7	.54	0.80	.26	6	40
13.....	8-0	105	1.4	5.4	4.0	.45	0.60	.51	33	50
14.....	8-3	93	1.3	2.0	0.7	.50	0.80	.23	4	12
15.....	10-5	98	1.0	1.5	0.5	.22	0.26	.04	19	40
16.....	9-10	99	2.1	3.4	1.3	.48	0.73	.25	9	30
17.....	10-2	82	1.1	1.7	0.6	.28	0.42	.14	3	12
18.....	8-1	118	2.1	3.0	0.9	.61	0.81	.20	2	8
19.....	9-6	79	1.4	2.2	0.8	.46	0.61	.15	7	12
20.....	14-2	83	1.3	2.2	0.9	.19	0.31	.12	3	20
21.....	6-5	110	1.0	3.7	2.7	.72	1.27	.55	19	90
22.....	10-10	106	3.1	4.6	1.5	.56	0.74	.18	9	30
23.....	7-1	113	1.0	2.5	1.5	.50	0.77	.27	9	24
24.....	6-11	115	1.5	2.5	1.0	.68	1.08	.40	2	10
25.....	12-0	83	1.3	2.8	1.5	.25	0.53	.28	2	40
26.....	15-8	76	4.2	4.9	0.7	.56	0.64	.08	2	5
27.....	8-6	106	1.1	1.5	0.4	.39	0.44	.05	2	12
28.....	11-10	73	1.5	3.3	1.8	.35	0.57	.22	15	120
29.....	6-8	121	1.0	3.9	2.9	.48	1.08	.60	19	80
30.....	9-2	80	2.1	3.6	1.5	.79	1.05	.26	9	15
31.....	8-7	100	2.6	3.9	1.3	.59	0.85	.26	5	10
32.....	8-3	80	1.2	2.2	1.0	.57	0.76	.19	8	10
33.....	10-3	97	3.2	4.5	1.3	.68	0.87	.19	6	24
34.....	8-1	114	2.4	4.5	2.1	.63	0.93	.30	14	20
35.....	7-8	120	1.0	3.5	1.9	.50	0.81	.31	4	25
36.....	8-5	116	2.7	4.1	1.4	.71	0.80	.18	9	30
37.....	8-2	114	1.4	2.3	0.9	.45	0.68	.23	5	12
38.....	14-1	94	3.8	5.0	1.2	.43	0.53	.10	3	18
39.....	9-0	120	2.8	3.8	1.0	.68	0.84	.16	3	12
40.....	13-4	97	3.8	5.2	+1.4	0.53	0.71	+0.18	3	18

## CHILDREN WHO CANNOT READ

TABLE XXX—Continued

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEV- EMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST	APPROX- IMATE HOURS' TREAT- MENT
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained		
41	7-7	103	1.1	3.3	+2.2	0.53	0.99	+0.46	8	30
42	7-7	94	1.2	1.7	0.5	.55	0.59	.04	3	12
43	12-3	107	4.6	7.9	3.3	0.62	0.92	+0.30	9	40
44	Adult	99	4.4	5.7	1.2	No norms for adults			3	10
45	13-7	105	3.6	7.6	4.0	0.46	0.83	+0.37	9	120
46	9-4	96	2.9	4.1	1.2	.76	1.00	.24	3	12
47	10-6	93	2.7	4.1	1.4	.56	0.75	.19	11	14
48	7-4	135	1.4	6.3	4.9	.41	1.06	.65	25	60
49	13-5	125	4.6	5.7	1.1	.51	0.65	.14	4	18
50	9-8	75	1.4	1.6	0.2	.44	0.53	.09	2	8
51	14-1	101	3.3	4.2	0.9	.39	0.48	.09	5	16
52	10-3	93	2.7	4.7	2.0	.59	0.67	.08	16	124
53	9-4	110	3.1	3.6	0.5	.62	0.67	.05	3	18
54	12-9	92	4.0	5.2	1.2	.59	0.75	.16	3	18
55	11-6	86	3.0	3.8	0.8	.54	0.63	.09	4	12
56	15-3	107	5.2	7.3	2.1	.52	0.68	.16	5	12
57	12-11	89	3.2	4.3	1.1	.48	0.64	.16	4	14
58	15-1	96	2.9	4.8	1.9	.37	0.56	.19	7	12
59	10-10	82	1.5	2.8	1.3	.34	0.58	.24	6	18
60	14-9	82	5.0	5.8	0.8	.69	0.75	.06	3	18
61	13-2	88	3.7	4.7	1.0	.59	0.70	.11	9	16
62	9-5	101	1.2	2.5	1.3	.22	0.52	.30	7	20
63	12-6	125	6.2	7.6	1.4	.79	0.93	.14	4	10
64	14-3	96	5.0	6.4	1.4	.57	0.73	.16	2	10
65	13-0	96	4.4	5.9	1.5	.64	0.80	.16	5	14
66	10-2	83	3.2	3.7	0.5	.84	0.88	.04	3	14
67	7-11	105	2.0	3.1	1.1	.66	0.94	.28	3	28
68	9-0	91	2.7	5.1	2.4	.64	0.78	.14	16	95
69	11-4	87	1.8	2.2	0.4	.35	0.42	.07	2	30
70	8-9	100	2.9	3.5	0.6	.67	0.81	.13	2	18
71	9-3	116	2.9	3.8	0.9	.59	0.77	.18	2	20
72	8-9	123	2.7	3.6	0.9	.58	0.75	.17	2	22
73	9-5	96	3.0	3.8	0.8	.05	0.86	.21	2	18
74	6-4	117	1.1	1.4	0.3	.64	0.82	.18	2	20
75	8-10	84	1.8	2.8	1.0	.62	0.90	.28	2	24
76	9-9	95	1.2	1.6	0.4	.30	0.39	.09	2	18
77	6-6	128	1.0	1.9	0.9	.47	0.90	.43	2	20
78	7-3	123	1.5	2.3	0.8	.55	0.74	.19	2	22
79	6-6	128	1.3	2.1	0.8	.61	0.80	.19	3	18
80	8-8	82	1.0	1.5	+0.5	0.45	0.47	+0.02	12	12

TABLE XXX—Continued

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEV- EMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST	APPROX- IMATE HOURS' TREAT- MENT	
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained			
81.....	9-1	100	2.8	3.8	+1.0	0.64	0.81	+0.17	2	28	
82.....	11-1	115	3.1	3.7	0.6	.53	0.63	.10	3	12	
83.....	10-10	100	2.0	4.3	2.3	.41	0.61	.20	23	40	
84.....	10-10	118	3.5	4.0	0.5	.61	0.62	.01	4	12	
85.....	11-7	87	1.2	1.7	0.5	.24	0.31	.06	5	20	
86.....	11-1	100	4.5	5.0	0.5	.76	0.78	.02	5	20	
87.....	11-10	122	4.4	6.6	2.2	.50	0.68	.18	4	18	
88.....	11-8	80	1.9	2.7	0.8	.37	0.48	.11	8	20	
89.....	7-11	134	2.1	3.8	+1.7	0.53	0.88	+0.35	4	26	
Mean of all cases (N = 89)	10-1	100	7.2	48	3.83	+1.39	0.525	0.723	+0.193	6.8	26.9
Mean of cases having I.Q.'s of 110 or above (N = 26)	9-8	115	9.2	21	3.93	1.72	.552	.821	.269	6.3	24.4
Mean of cases having I.Q.'s of 90-109 (N = 41)	10-4	98	9.2	88	4.43	1.55	.527	.745	.218	7.8	32.7
Mean of cases having I.Q.'s below 90 (N = 22)	11-3	81	7.2	07	3.03	+0.96	0.454	0.606	+0.152	6.0	22.8

made a decided increase in reading achievement and in reading index during the period of remedial instruction. Group C, which received no training, however, made very little progress, showing an average gain of 0.14 year in eight months, a gain which may represent only a chance variation or possible practice effect on the test. Group C not only failed to advance in reading index, but suffered a loss of several points. It appears from these data

## CHILDREN WHO CANNOT READ

TABLE XXXI

## GROUP B: CASES TRAINED BY THEIR TEACHERS AT SCHOOL

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIE- MENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST	APPROX- IMATE HOURS' TREAT- MENT
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained		
1.....	12-8	83	3.4	3.7	+0.3	0.58	0.59	+0.01	8	19
2.....	9-11	74	1.0	1.4	0.4	.32	.39	+.07	6	12
3.....	12-8	76	2.0	2.9	0.0	.55	.50	-.05	8	10
4.....	15-7	66	3.3	4.1	0.8	.47	.56	+.09	3	16
5.....	8-1	95	1.6	3.1	1.5	.56	.75	+.19	15	44
6.....	10-0	82	2.7	3.2	0.5	.49	.53	+.04	9	24
7.....	11-5	81	2.4	2.5	0.1	.51	.52	+.01	4	12
8.....	14-4	94	5.0	5.7	0.7	.60	.60	+.00	11	10
9.....	12-2	74	1.2	1.7	0.5	.26	.33	+.07	7	18
10.....	9-6	103	2.3	2.7	0.4	.56	.62	+.06	4	14
11.....	16-1	66	2.6	2.9	0.3	.38	.40	+.02	2	12
12.....	12-8	74	4.0	4.4	0.4	.69	.73	+.04	4	12
13.....	12-4	102	3.3	4.4	1.1	.50	.61	+.11	8	16
14.....	9-1	110	3.1	3.9	0.8	.76	.83	+.07	3	12
15.....	8-4	90	1.5	2.2	0.7	.48	.69	+.19	3	18
16.....	16-5	78	2.1	3.1	1.0	.25	.36	+.11	3	19
17.....	8-9	85	1.0	1.5	0.5	.35	.45	+.10	6	29
18.....	9-3	98	1.3	2.7	1.4	.35	.71	+.36	3	28
19.....	12-10	102	4.5	4.9	0.4	.63	.68	+.05	4	14
20.....	14-11	92	4.9	7.7	2.8	.56	.83	+.27	6	37
21.....	14-0	80	2.9	3.6	0.7	.47	.53	+.06	4	20
22.....	16-3	77	3.7	3.8	0.1	.46	.44	-.02	2	11
23.....	12-7	94	4.0	4.1	0.1	.62	.61	-.01	3	11
24.....	9-0	100	1.3	2.0	0.7	.35	.45	+.10	7	18
25.....	12-5	83	1.9	3.1	1.2	.37	.53	+.16	12	29
26.....	12-5	75	1.3	2.5	1.2	.25	.44	+.19	8	28
27.....	14-8	61	1.7	1.7	0.0	.32	.27	-.05	7	9
28.....	7-11	102	1.2	2.0	0.8	.43	.61	+.18	5	12
29.....	16-1	82	3.4	4.4	1.0	.40	.47	+.07	14	34
30.....	10-5	90	1.4	2.5	1.1	.33	.45	+.12	15	19
31.....	10-4	109	4.3	5.6	1.3	.75	.95	+.20	3	16
32.....	9-9	132	3.9	5.0	1.1	.72	.82	+.10	6	12
33.....	11-6	97	3.7	4.7	1.0	.65	.80	+.15	6	17
34.....	10-9	93	2.3	2.8	0.5	.49	.52	+.03	8	11
35.....	11-1	101	4.1	4.6	0.5	.59	.81	+.22	4	14
36.....	10-10	87	1.8	2.6	0.8	.40	.55	+.15	5	14
37.....	10-7	91	1.8	2.8	1.0	.38	.55	+.17	8	12
38.....	9-7	88	2.3	3.5	1.2	.64	.66	+.02	26	37
39.....	8-9	105	1.2	1.9	0.7	.24	.51	+.27	7	12
40.....	10-6	118	1.8	3.2	+1.2	0.33	0.53	+0.20	11	18

TABLE XXXI—Continued

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEV- EMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST	APPROX- IMATE HOURS' TREAT- MENT	
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained			
41	14-8	93	4.6	6.1	+1.5	0.53	0.66	+0.13	6	14	
42	18-0	110	1.0	1.5	0.5	.34	.44	+ .10	2	10	
43	11-8	112	4.3	4.8	0.5	.73	.80	+ .07	2	10	
44	7-5	111	1.1	2.4	1.3	.41	.62	+ .21	20	19	
45	11-0	94	3.0	4.0	1.0	.60	.71	+ .11	8	24	
46	11-7	90	1.3	2.4	1.1	.24	.40	+ .16	9	22	
47	9-0	72	1.2	1.7	0.5	.43	.55	+ .12	3	18	
48	11-0	87	2.7	3.3	0.6	.54	.56	+ .02	15	12	
49	12-1	88	3.1	4.0	0.9	.57	.68	+ .11	7	16	
50	12-10	91	4.0	5.5	+1.5	0.57	0.71	+0.14	9	19	
Mean of all cases (N = 50)			11-7	89.2	2.65	3.43	+0.79	0.479	0.595	+0.116	7.1
Mean of cases having I.Q.'s of 110 or above (N = 6)			9-4	115.5	2.76	3.66	.90	.548	.756	.208	7.3
Mean of cases having I.Q.'s of 90-109 (N = 22)			11-2	96.9	2.84	3.83	.99	.500	.645	.145	6.9
Mean of cases having I.Q.'s of below 90 (N = 22)			12-8	74.3	2.39	2.97	+0.58	0.441	0.502	+0.061	7.4
										19.0	

that children who have difficulty in learning to read do not usually overcome the difficulty under ordinary school instruction but are able to make normal and accelerated progress under special methods adapted to their difficulties. The three groups of children were very similar in their initial reading indices before the remedial instruction.

## CHILDREN WHO CANNOT READ

TABLE XXXII  
GROUP C: CASES RECEIVING NO REMEDIAL WORK

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEVEMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained	
1.....	11-2	69	1.0	1.1	+0.1	0.29	0.25	-0.04	12
2.....	10-0	83	1.2	1.5	+.3	.32	.36	+.04	3
3.....	14-0	66	3.9	4.2	+.3	.71	.64	-.07	4
4.....	13-11	84	4.2	4.7	+.5	.65	.66	+.01	12
5.....	10-3	96	3.4	4.2	+.8	.70	.76	+.06	12
6.....	9-11	97	3.4	3.8	+.4	.79	.84	+.05	4
7.....	8-1	95	1.0	1.0	.0	.43	.38	-.05	8
8.....	11-2	88	2.6	2.6	.0	.57	.44	-.13	9
9.....	11-2	79	1.3	1.5	+.2	.25	.28	+.03	8
10.....	8-3	95	1.0	1.0	.0	.43	.29	-.14	12
11.....	6-6	111	1.0	1.1	+.1	.66	.58	-.08	4
12.....	11-4	94	1.3	1.2	-.1	.25	.18	-.07	14
13.....	12-10	94	2.6	2.0	-.6	.37	.26	-.11	6
14.....	10-9	106	4.2	4.2	.0	.80	.71	-.09	8
15.....	7-9	88	1.0	1.0	.0	.53	.45	-.08	6
16.....	9-3	93	2.7	3.4	+.7	.73	.78	+.05	10
17.....	10-7	99	3.4	3.0	-.4	.73	.54	-.19	7
18.....	9-11	94	2.9	3.1	+.2	.69	.62	-.07	9
19.....	7-8	96	1.0	1.0	.0	.50	.43	-.07	6
20.....	15-4	72	2.5	2.8	+.3	.33	.39	+.06	7
21.....	11-7	106	4.6	4.0	-.6	.74	.62	-.12	2
22.....	6-10	121	1.0	1.0	.0	.45	.38	-.07	4
23.....	8-2	82	1.0	1.0	.0	.53	.45	-.08	7
24.....	12-10	65	1.0	1.0	.0	.22	.18	-.04	22
25.....	13-2	83	2.6	1.8	-.8	.46	.29	-.18	9
26.....	14-3	66	2.3	2.6	+.3	.39	.38	-.01	23
27.....	8-11	74	1.0	1.3	+.3	.53	.38	-.15	11
28.....	13-2	90	1.3	1.5	+.2	.21	.22	+.01	5
29.....	13-2	73	3.3	3.2	-.1	.61	.57	-.04	4
30.....	6-10	121	1.5	1.5	.0	.60	.54	-.06	5
31.....	13-1	102	4.4	4.6	+.2	.61	.59	-.02	5
32.....	7-4	106	1.0	1.5	+.5	.43	.50	+.07	6
33.....	8-7	114	2.3	1.9	-.4	.68	.48	-.20	4
34.....	8-7	79	2.8	2.8	.0	.90	.88	-.02	5
35.....	9-11	94	3.7	3.9	+.2	.80	.82	+.02	4
36.....	9-5	111	2.1	2.4	+.3	.48	.46	-.02	9
37.....	9-1	100	2.5	2.8	+.3	.69	.64	-.05	10
38.....	10-6	90	3.4	3.6	+.2	.72	.63	-.09	4
39.....	8-11	98	1.8	2.1	+.3	.50	.55	+.05	7
40.....	8-10	95	1.7	2.2	+0.5	0.50	0.52	+0.02	12

TABLE XXXII—*Continued*

CASE	C.A. AT DATE OF FIRST TEST	STAN- FORD- BINET I.Q.	READING ACHIEVEMENT; AVERAGE OF FOUR TESTS			READING INDEX			MONTHS FROM FIRST TO LAST TEST
			First Test	Last Test	Years Gained	First Test	Last Test	Points Gained	
41.....	11-4	98	3.8	4.1	+0.3	0.67	0.71	+0.04	4
42.....	7-6	100	1.1	1.4	+ .3	.46	.39	-.07	16
43.....	11-8	93	2.3	2.8	+ .5	.49	.46	-.03	13
44.....	11-10	90	4.6	4.8	+ .2	.85	.75	-.10	6
45.....	10-8	87	1.9	1.8	-.1	.41	.40	-.01	2
46.....	11-1	91	1.8	1.9	+ .1	.55	.56	+ .01	12
47.....	13-10	100	4.9	5.7	+ .8	.60	.62	+ .02	9
48.....	9-3	72	1.7	1.8	+ .1	.55	.56	+ .01	6
49.....	9-0	107	2.4	3.0	+ .6	.63	.65	+ .02	13
50.....	13-7	91	5.5	5.5	0 0	0.71	0.70	-.001	10
Mean of all cases (N = 50).....	10-5	91.5	2.41	2.55	+0.14	0.554	0.514	-0.040	8.2
Mean of cases hav- ing I.Q.'s of 110 or above (N = 5).....	7-8	115.6	1.58	1.58	.00	.574	.485	.089	5.2
Mean of cases hav- ing I.Q.'s of 90-109 (N = 28) .	10-4	96.8	2.77	2.97	.20	.592	.561	.031	8.3
Mean of cases hav- ing I.Q.'s of below 90 (N = 17) .	11-4	77.0	2.07	2.15	+0.08	0.485	0.444	-0.041	8.8

The success of the remedial methods by various criteria of progress is shown in Table XXXIII.

As judged by the criterion of the reading index, the remedial work was successful in bringing 36 per cent of Group A and 14 per cent of Group B up to standard, or borderline standard, for the children's expectancies. The criterion of bringing the child's reading index up to standard is a very difficult one to meet, but one which, in every case accomplished, has made a profound improve-

ment in the child's educational adjustment and has resulted in marked increase in his personal happiness.

TABLE XXXIII  
COMPARISON OF GROUPS A, B, AND C BY VARIOUS  
CRITERIA OF PROGRESS IN READING

CRITERIA OF PROGRESS IN READING	GROUPS RECEIVING REMEDIAL INSTRUCTION		GROUP RECEIVING NO REMEDIAL INSTRUCTION C, N = 50
	A, N = 89	B, N = 50	
Frequency			
Number of years' gain in reading achievement:			
0.0 to 0.3.....	2	7	41
0.4 to 0.7.....	17	17	7
0.8 to 1.5.....	46	26	2
1.6 to 2.3.....	14	0	.....
2.4 to 3.1.....	6	1	.....
3.2 to 3.9.....	1	.....	.....
4.0 to 4.7.....	2	.....	.....
4.8 to 5.1.....	1	.....	.....
Number of points' gain in reading index:			
-20 to -11.....	.....	.....	8
-10 to -1.....	.....	4	25
0 to +9.....	18	18	17
+10 to +19.....	35	21	.....
+20 to +29.....	20	6	.....
+30 to +39.....	9	1	.....
+40 to +49.....	3	.....	.....
+50 to +59.....	2	.....	.....
+60 to +69.....	2	.....	.....
Per Cent			
Cases making accelerated progress in reading.....	93	52	0
Cases making normal progress in reading.....	5	14	4
Cases making retarded progress in reading.....	2	34	96
Cases brought up to standard or borderline standard in reading index (i.e., above 0.80).....	36	14	2

As judged by the criterion of accelerated progress in reading, i.e., more than one month's progress for one month's training, the remedial work was successful in 93 per cent of the cases in Group A and 52 per cent of the cases in Group B. It is probable that with

continued remedial instruction the children who show accelerated progress in reading will ultimately reach the standard reading index. For example, an eighth-grade boy of average intelligence who reads with third-grade achievement may gain a year in reading in two months' time, thereby showing accelerated progress, and still have a reading index far below standard. The remedial work in such cases must be given for a prolonged period of time in order to bring the reading index up to standard. We are continuing the remedial work with as many such cases as possible. The children who made accelerated progress in reading during remedial work usually showed an improvement in their educational adjustments and in personality and behavior even though not yet up to grade in reading. Only two of the eighty-nine children of Group A, or approximately 2 per cent, failed to make accelerated or normal progress in reading under remedial instruction. These two cases were analyzed carefully in order to determine why the remedial work was not so successful as with the other cases.

Case 15, who gained one-half year in reading after forty hours' work spread over nineteen months' time, was a boy who presented a severe behavior problem, characterized by infantile temper tantrums, crying, resistance, incorrigibility, and threatened expulsion from school. The psychologist who worked with the child gave the following report at the time of the last retest:

The improvement in reading is regarded as encouraging in view of the severity of the reading disability (reading index 0.22) and of the patient's behavior difficulties. For each hour devoted to the patient, only a small proportion actually went toward the reading work. The amount of improvement is therefore good in proportion to the hours spent, even though the lessons were scattered over a number of months. There is sufficient proof that the patient can learn to read by these methods: Formerly he had been in school five years and made *no* progress, whereas now, in a course of forty hours which equals only about two months of school work, he has made a half-year's gain. So far the training has been, of necessity, directed toward obtaining the boy's co-operation. There has been a great change in the patient although he is still difficult to work with. He now shows definite interest in learning to read. He shows satisfaction in being able to read simple words and sentences. He is often able to sit quietly from half an hour to an hour, making only a few attempts to divert the conversation from the read-

ing work. He is still variable in performance. On some days he is not able to work for more than ten minutes without becoming stubborn, irritable, and restless, while on other days, if not too much is demanded of him, he remains co-operative throughout an hour's period. The remedial instruction has been an interesting trial in motivating and teaching as difficult a case of combined reading disability and behavior disorder as has been known to the Institute.

Case 80 was a child of backward intelligence who made one-half year's progress in twelve hours of remedial work in the course of twelve months' time. His improvement in reading was very good for the number of hours' work spent with him, but we were unable to arrange a steady, continuous program, so that the training was irregular and averaged only one hour's treatment a month. In his case the failure to make normal or accelerated progress in reading was due to our inability to provide an adequate program.

The children in Group B, although not receiving the intensive work done in Group A, showed a good measure of success. Sixty-six per cent of them made normal or accelerated progress under the remedial instruction. The seventeen cases who failed to make normal progress were found to consist of (1) children whose reading disabilities were complicated by behavior problems which the teachers were not able to control; (2) children who were given so few hours or treatment so irregular as to time that one would not reasonably expect much progress; and (3) children who were of inferior intelligence and were regarded by the teachers as unlikely to improve, an attitude which inhibited the teacher's results with the child. We found it much easier to obtain the teacher's co-operation in the cases of superior and average intelligence than in the cases of dull or inferior intelligence.

The results of the remedial work are shown graphically in Figures 35, 36, and 37. Figure 35 shows a comparison of the distributions of reading indices of Groups A and C at the first and last tests; the groups have very similar distributions and means at the initial tests. After remedial instruction Group A changed markedly and progressed toward the normal distribution of indices of unselected school children. Group C, which received no remedial work, remained at practically the same, or slightly lower, position on the scale of reading indices.

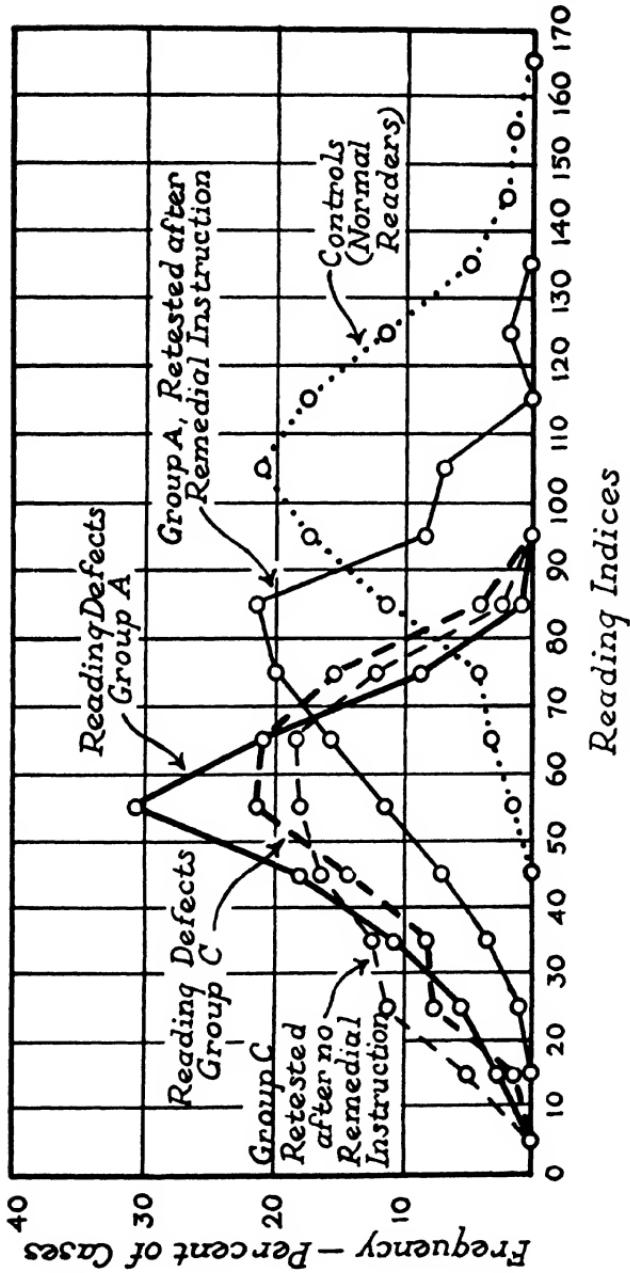


FIG. 35.—Distributions of reading indices before and after remedial instruction

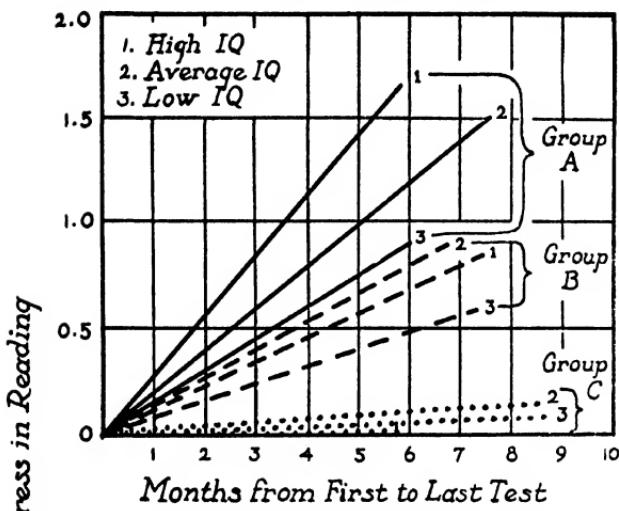


FIG. 36

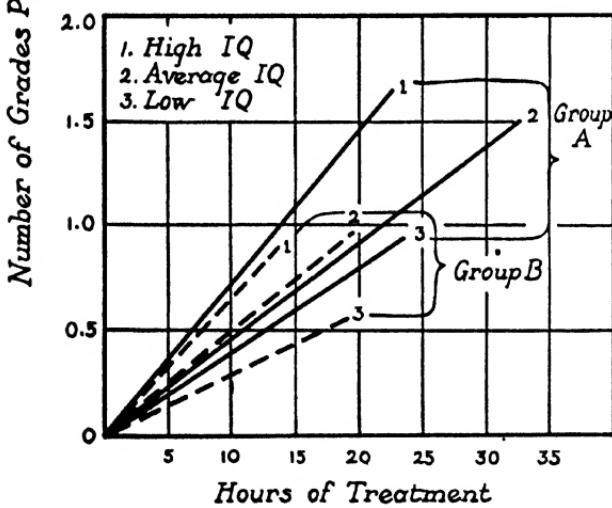


FIG. 37

Group A received intensive remedial instruction  
 " B       "       moderate       "       "  
 " C       "       no       "       "

FIG. 36.—Rates of progress in reading for month's treatment

FIG. 37.—Rates of progress in reading for hour's treatment

Figure 36 represents the rates of improvement in reading in the three intelligence subdivisions of Groups A, B, and C. The gain in reading achievement is plotted against the number of months elapsing between the initial and final tests. The superiority of Group A over Group B, and of Groups A and B over Group C, is clearly indicated. Figure 37 represents the rates of improvement in reading in the three intelligence subdivisions of Groups A and B, by plotting the gain in reading achievement against the number of hours of remedial treatment.

In Figure 37 the superiority of Group A over Group B disappears in the rates of progress, except for the low intelligence-quotient classification. It appears that the greater percentage of successes in the remedial work in Group A is due primarily to the greater number of hours spent in the training. Had the teachers of Group B spent the amount of time in the work given by the teachers of Group A, it is probable that the percentages of successes obtained in Group B would have been more nearly similar to those of Group A.

Besides the remedial reading work, controlled from the laboratories of the Institute for Juvenile Research, we co-operated with two cities in an experiment conducted in the public schools.

City A is a progressive community near Chicago. At the invitation of the superintendent of schools and the department of educational council, we conducted an experiment to determine the amount of progress which could be made in reading under school conditions. Fifteen children having severe reading disabilities were selected for the study, and were given the series of intelligence and diagnostic reading tests. Fifteen teachers were then chosen from a number of volunteers and each teacher was assigned to one of the children. Each teacher gave the training to her case individually at regular periods during two months. A demonstration lesson was given at the beginning of the experiment to show the exact procedures to be used with the children. The fifteen teachers then met weekly for a course of five conferences on reading disabilities and remedial methods. Lectures were planned to cover the types of problems found in the fifteen children, illustrative material was selected from the cases under treat-

ment, and at the end of each lecture a general discussion followed in which the teachers asked questions regarding their difficulties in the application of the remedial methods and received additional suggestions. At the end of two months the children were re-examined and their progress determined. The results of the experiment are tabulated in Table XXXIV, which shows that an average gain in reading of 0.67 year was obtained by the fifteen children in two months' remedial work.

TABLE XXXIV  
EXPERIMENT IN REMEDIAL READING IN CITY A

CASE	C.A.	GRADE	STANFORD-BINET I.Q.	READING ACHIEVEMENT: AVERAGE OF FOUR TESTS			APPROXIMATE HOURS' TREATMENT
				First Test	Last Test	Years Gained	
1.....	11-7	4	100	2.0	3.1	+1.1	20
2.....	11-4	5	97	3.7	4.7	1.0	13
3.....	11-8	4	93	2.2	2.8	0.6	14
4.....	11-0	6	90	4.6	5.0	0.4	13
5.....	11-2	5	91	3.2	4.3	1.1	10
6.....	10-8	3	87	1.7	1.8	0.1	8
7.....	10-7	2	91	1.7	2.6	0.9	8
8.....	10-3	4	88	2.3	2.8	0.5	14
9.....	8-4	2	110	1.1	1.5	0.4	16
10.....	11-8	6	109	4.3	4.8	0.5	22
11.....	8-0	1	111	1.1	1.5	0.4	9
12.....	11-8	4	94	3.0	4.0	1.0	20
13.....	9-3	3	72	1.2	1.7	0.5	14
14.....	12-8	6	88	3.2	4.0	0.8	12
15.....	12-10	7	91	4.0	4.8	+0.8	15
Mean....	10-10	4	94.13	2.62	3.29	+0.67	13.8

In City B, another community near Chicago, a second experiment was conducted at the invitation of the superintendent of schools and the director of the department of methods and research. The remedial work was confined to the teachers of the primary grades, who were invited to a conference on remedial reading.

The general problem and nature of the research were discussed at this conference and the remedial methods were described. Seventy-six teachers volunteered to assist in the experiment. Of these, thirty teachers were chosen to do the remedial training. The group was limited to allow free discussion.

The children were selected as a result of a survey of reading which had just been completed in the primary grades. All the children had been given the three Gates Primary Reading Tests, Gray's Oral Reading Check Tests, and the Pintner Cunningham or Otis Primary Intelligence Test. The scores on the reading tests were transcribed into grade units, and were ranked in each class, beginning with the highest and ending with the lowest scores. The children finally chosen for the remedial work were the brightest poor readers in their classes as judged by their intelligence quotients, on the one hand, and the ranking of the reading tests, on the other. Since the experiment was conducted in the spring, the grade standards for each class were above the usual standards.

Each teacher was assigned to a child by the supervisor. The teachers were assigned the children whom they had previously failed to teach to read, providing there was no undesirable emotional reaction between teacher and child. In this way the teacher was able to compare the progress under the special methods with previous progress under ordinary instruction. In cases of undesirable emotional reactions between teacher and child, the child was assigned to another teacher.

The teachers met for five conferences during the period of remedial instruction. At the first conference the method of analyzing errors was described and the teachers were asked to make a tabulation of the oral reading errors of the children whom they were assigned to train. On the basis of their tabulations the child's outstanding errors were determined and the methods of remedial instruction for the various error-types were described. Between conferences the supervisor visited each teacher and further checked the remedial work to correct any difficulties which the teacher encountered in following directions. At each succeeding conference the problems were discussed and methods amplified.

After five weeks' intensive training, during which time each child received twenty to thirty minutes daily, or several times weekly, the children were recalled for retests. The three Gates Primary Tests and Gray's Oral Check Tests were repeated, using alternate forms to avoid practice effect. The results of the tests are given in Table XXXV, which shows that an average gain of

0.81 year's achievement in reading resulted from the five weeks' training of the thirty cases.

In the former experiments remedial methods were applied individually. Another experiment was made in which the instruc-

TABLE XXXV  
EXPERIMENT IN REMEDIAL READING IN CITY B

CASE	C.A.	GRADE	PINTNER-CUNNINGHAM OR OTIS PRIMARY TEST I.Q.	READING ACHIEVEMENT; AVERAGE OF FOUR TESTS			APPROXIMATE HOURS' WORK
				First Test	Last Test	Years Gained	
1.....	7-3	2	124	2 1	2 8	+0.7	15
2.....	10-1	3	121	1 9	3 3	1 4	8
3.....	7-10	2	116	2.5	3 4	0.9	8
4.....	7-10	2	104	1 7	2 8	1 1	14
5.....	8-6	3	112	3 2	3 4	0.2	10
6.....	7-2	2	115	1 7	2 8	1 1	13
7.....	7-10	2	119	1.5	2 4	0.9	15
8.....	8-6	3	117	2 5	3 7	1.2	7
9.....	8-6	3	109	2 9	3.6	0.7	10
10.....	6-10	2	127	2 2	3 4	1.2	15
11.....	9-3	4	116	4 2	6 0	1.8	8
12.....	6-9	1	124	1 9	3 2	1 3	12
13.....	8-1	2	92	3 2	3 5	0.3	7
14.....	9-2	2	88	2.6	3 2	0.6	7
15.....	7-7	2	120	2 1	3 0	0.9	7
16.....	7-8	2	114	1 7	2.3	0.6	7
17.....	7-2	2	118	1 9	2 2	0.3	10
18.....	7-5	2	122	1 5	2 2	0.7	12
19.....	8-8	2	123	2 1	3 1	1 0	14
20.....	7-11	2	131	3 1	3 5	0.4	7
21.....	7-7	2	115	2 2	3 1	0.9	6
22.....	6-7	1	125	1 4	1 9	0.5	7
23.....	8-5	2	106	1 7	2 0	0.3	7
24.....	7-6	2	108	2 2	3 3	1 1	14
25.....	7-3	2	117	1 5	1 9	0.4	7
26.....	7-0	2	117	1.6	1 9	0.3	7
27.....	7-2	2	121	1.7	2 9	1 2	14
28.....	7-6	2	111	1.8	3 0	1.2	14
29.....	9-2	3	107	1 9	2.6	0.7	10
30.....	8-1	3	87	2 9	3 5	+0.6	10
Mean.....	7-10	2	114.2	2 18	2 99	+0.81	10.1

tion was given to a number of children meeting in small groups. Forty-one children who had severe reading disabilities were selected from all grades in City B. The children were grouped into small classes which met with a trained teacher two or three times a week, for thirty- or forty-minute periods. The children remained

in their classrooms at other times, but were excused to attend the special classes. Diagnostic tests were given to each child, and the grouping of the children was arranged to place together as nearly as possible those who had reached similar stages of reading achievement and who showed similar types of errors. The results of the experiment are shown in Table XXXVI, which indicates that the groups made an average gain of 0.7 year for the younger children and 1.5 years for the older children in two months' time.

A second experiment in giving remedial instruction to small groups of children was made at a special school for truant children. Ten boys whose I.Q.'s ranged from 71 to 99, whose ages ranged from eleven to sixteen, and who were severely retarded in reading, were selected for the experiment by the school psychologist. The remedial treatment was given in five-member groups, meeting daily for three months. At the end of the period the ten boys made an average gain of one year in reading. Individual gains ranged from 0.3 to 1.9 years. An extract from the psychologist's report follows:

As an example of the change in the boys' attitude brought about by the remedial reading class, the following is worthy of notice. Four boys who had been adjudged as eighth-grade graduation material, except for their handicap in reading, refused the graduation certificate which was offered to them in June because they wanted to keep on working with their reading until the end of August. These boys, who had been truants in former schools, were now supplicants for the privilege of attending school during the hot months of July and August in order to continue their work in the reading class.

The results of the remedial work may be summarized as follows:

Two hundred and thirty-five children were given remedial training by one hundred and thirty-one teachers. Progress in reading was made in a large percentage of the cases studied, not only when the children were trained under carefully controlled laboratory conditions, but also under conditions possible in public schools. Progress in reading was made under individual instruction and also in small groups of children selected for similarity of achievements and errors.

TABLE XXXVI  
EXPERIMENT IN GROUP INSTRUCTION IN REMEDIAL  
READING IN CITY B

GROUP	CASE	C.A. AT DATE OF FIRST TEST	GRADE	OTIS GROUP TEST I.Q.	READING ACHIEVEMENT: AVERAGE OF FOUR TESTS			TIME DEVOTED TO GROUP INSTRUCTION
					First Test	Last Test	Years Gained	
<b>Advanced:</b>								
Sec. I.....	1	14	7	82	5.2	6.4	+1.2	2 months
	2	12	7	102	5.3	5.9	0.6	16 hours
	3	15	8	88	4.7	7.1	2.4	.....
	4	14	8	88	5.4	7.7	2.3	.....
	5	15	8	96	6.1	8.4	2.3	.....
	6	12	7	108	5.9	7.7	1.8	.....
	7	15	7	82	4.6	6.4	1.8	.....
	8	14	7	69	4.6	5.4	0.8	.....
	9	14	8	90	5.1	7.5	2.4	.....
	10	13	7	88	4.7	5.2	0.5	.....
	11	12	6	90	5.2	5.7	0.5	.....
Sec. II.....	1	16	8	75	5.4	6.1	0.7	6 weeks
	2	15	7	77	4.1	5.8	1.7	12 hours
	3	12	7	88	6.0	7.1	+1.1	.....
Mean.....		13.7	7.3	87.3	5.1	6.6	+1.5	15.1
<b>Intermediate:</b>								
Sec. I.....	1	12	5	84	3.8	4.8	+1.0	2 months
	2	10	5	96	4.3	4.7	0.4	16 hours
	3	11	6	110	3.9	4.8	0.9	.....
	4	11	6	96	3.3	4.2	0.9	..
	5	10	5	93	3.6	4.4	0.8	.....
	6	13	6	89	3.6	4.3	0.7	.....
	7	11	5	90	3.9	4.2	0.3	.....
	8	10	4	108	3.5	4.0	0.5	.....
	9	12	5	105	3.7	4.6	0.9	..
Sec. II.....	1	12	4	84	2.5	3.2	0.7	2 months
	2	10	5	108	3.1	3.5	0.4	20 hours
	3	10	4	86	2.1	3.0	0.9	.....
	4	10	4	94	2.7	3.1	+0.4	.....
Mean.....		10.9	4.9	96.3	3.3	4.0	+0.7	17.2
<b>Primary:</b>								
Sec. I.....	1	9	3	122	2.8	3.5	+0.7	2 months
	2	8	3	93	2.7	3.5	0.8	16 hours
	3	0	3	110	2.6	2.8	0.2	.....
	4	10	3	83	2.1	2.6	0.5	.....
Sec. II.....	1	10	2	74	1.4	2.1	0.7	2 months
	2	11	3	82	1.7	2.3	0.6	16 hours

TABLE XXXVI—*Continued*

GROUP	CASE	C.A. AT DATE OF FIRST TEST	GRADE	OTIS GROUP TEST I.Q.	READING ACHIEVEMENT; AVERAGE OF FOUR TESTS			TIME DEVOTED TO GROUP INSTRUCTION
					First Test	Last Test	Years Gained	
Sec. III.....	1	9	3	90	1.4	2.4	1.0	2 months
	2	7	2	98	1.2	1.9	0.7	20 hours
	3	7	2	90	1.1	1.5	0.4	.....
	4	9	3	110	1.6	2.9	1.3	.....
Sec. IV.....	1	7	2	100	1.0	1.9	0.9	2 months
	2	7	2	104	1.2	1.6	0.4	20 hours
	3	8	2	98	1.0	2.0	1.0	.....
	4	10	2	94	1.0	1.3	+0.3	.....
Mean.....		8.6	2.5	96.9	1.6	2.3	+0.7	18.3
Mean for all groups.....		11.1	4.9	93.4	3.4	4.3	+0.9	17.3

The remedial-reading methods were found to be direct and readily understood. Public-school teachers learned to apply the methods in the course of conferences and demonstration lessons.

The rate of progress in reading under remedial instruction was found to be a function of the child's intelligence, his age, the number of hours spent in training, the number of months during which treatment was continued, the severity of the disability, the personality and behavior difficulties encountered in applying the remedial training, and the closeness of supervision of the remedial techniques. Children and teachers varied greatly with regard to these factors. Individual cases were found in which a low intelligence-quotient child surpassed a high intelligence-quotient child in rate of progress, or a few hours' remedial work brought greater progress than many hours, or one teacher mastered the remedial techniques more thoroughly in one sitting than another did in many sittings.

The remedial methods, consisting as they did of many methods adapted to the specific difficulties of the children, proved successful with the various types of cases. The children with whom the remedial work failed were those whose reading difficulties were complicated by behavior disorders which the teachers were unable

to control, or those to whom the remedial work was given irregularly and without persistent, systematic, or sympathetic treatment.

We noted a tendency for those teachers who worked with several successive cases to improve in technique of applying the remedial methods. It is probable that had we used only practiced teachers in the remedial work, instead of teachers who learned the methods at the same time that they trained the children, the progress would have been much greater than that reported here. Familiarity with the methods and materials enabled the teacher to devote more attention to obtaining *rappor*t with the child and to meeting the problems arising in behavior and personality and less to mastering the methods. The demonstration of success with one case also added to the teacher's feeling of security and confidence in training other cases, and made a subtle but effective change in her approach to the child.

## CHAPTER VIII

### TYPICAL CASE STUDIES

Nine cases who received intensive remedial training are presented to show the details of progress in reading and its effect upon educational adjustment and personality. The cases were selected from among those who have been studied for a time long enough to allow an evaluation of the results of treatment.

*Case 33* (Fig. 38).—Betty (who is also Case 3 of chap. ii) was completing the second grade when she was first examined. She had not learned to read

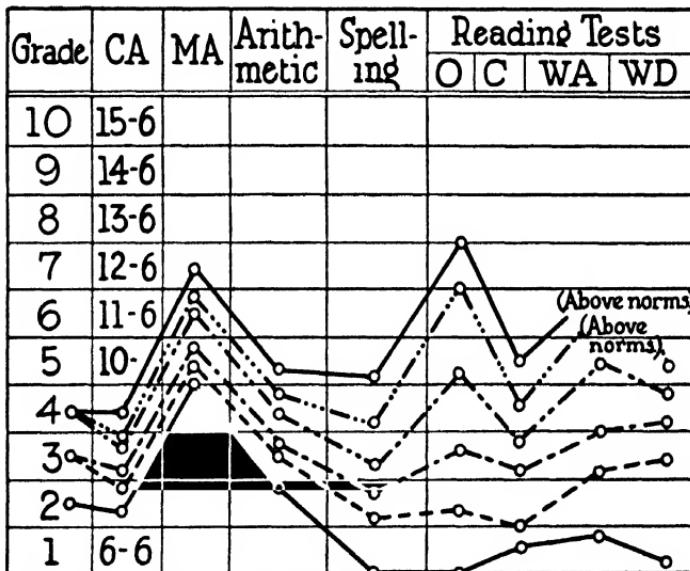


FIG. 38.—Case 33, Betty. Reading index, 0.41 to 1.06

after two years in school, even though her intellectual ability was rated as very superior. The results of the remedial instruction are shown in the accompanying tabulation.

#### ANALYSIS OF READING DISABILITY

Betty's reading errors at the first examination were excessive in vowels, reversals, omission of sounds, and refusals.

Related to her reading disability was a marked awkwardness and slowness in movement. She was inferior in physical sports, and generally slow in the

co-ordination of movements required in such acts as dressing herself, etc. There is no history of neurological illness. She is right-handed and right-eyed. She had developed some clever ruses for distracting teacher and examiner from asking her to read. When required to read she did so with tension, clearing her throat between words and flushing over her errors. She had easily memorized the primers in the first grade but could recognize few of the isolated words in unfamiliar material. She had difficulty in forming visual and auditory associations, forming none in the trials given, while unselected six-year-old children in the first grade can form seven such associations.

CASE 33: TEST SCORES BEFORE, DURING, AND  
AFTER TREATMENT

Test Scores	May 1929	Nov. 1929	March 1930	Sept. 1930	Jan. 1931	June 1931
C.A.....	7-4	7-9	8-1	8-7	8-10	9-5
M.A.....	10-0	(10-5)	(10-10)	(11-7)	(11-11)	(12-8)
I.Q. (Stanford-Binet).....	135	(135)	(135)	(135)	(135)	(135)
Gray's Oral Reading Paragraphs.....	1.0	2.4	3.7	5.2	7.0	8.0
Haggerty Reading Examination.....	1.6	2.0	3.1	3.8	.....	.....
Monroe Silent Reading Test.....	.....	.....	.....	.....	4.5	5.5
Iota Word Test.....	1.9	3.1	4.0	5.5	Above norms	.....
Word-Discrimination Test.....	1.2	3.3	4.2	4.9	5.3	Above norms
Stanford Achievement Test in Reading.....	.....	.....	.....	.....	4.6	5.4
Average reading grade.....	1.4	2.7	3.7	4.8	5.3	6.3
Ayers Spelling Scale.....	1.0	2.1	2.8	3.3	4.2	5.1
Stanford Arithmetic Computation Test.....	2.9	3.6	3.7	4.4	4.7	5.4
Reading index.....	0.41	0.68	0.86	0.96	1.02	1.06

ciations. She explained her reading disability by the rationalization, "Well, I don't happen to care for reading about little pigs. I wouldn't mind reading about astronomy though."

RESULTS OF TREATMENT

Remedial instruction in reading was given to Betty for approximately sixty hours, in thirty-minute periods, several times weekly between May, 1929, and September, 1930. She was later recalled for examinations to see whether or not progress continued without further special work.

Under the remedial instruction Betty improved 3.4 years in 1.3 years, and later added another 1.5 years' achievement without special work. Her reading index improved from 0.41, representing a severe retardation, to 1.06, representing high-average accomplishment in reading for her expectancy.

The improvement in educational adjustment is shown by the fact that,

although at the first test she was retarded in reading a year below her age, at the last test she was accelerated in reading almost two years above her age. The following quotation from a report by her principal gives a good summary of the present school adjustment:

.... I have just been giving the children of our school a series of achievement tests as a final check on the year's work and as a guide in recommendations. I think you will be interested to know of the excellent score of Betty ——. Betty's educational age on the complete Stanford Advanced Examination, Form A, was 11 years and 6 months. The whole test depends largely upon reading ability and yet in no section was her achievement age under 11. Betty is doing fine, steady, co-operative work in school. The children like her. ....

It is noted that Betty's scores on the reading tests involving speed are consistently lower than the scores on the tests that involve accuracy. Her

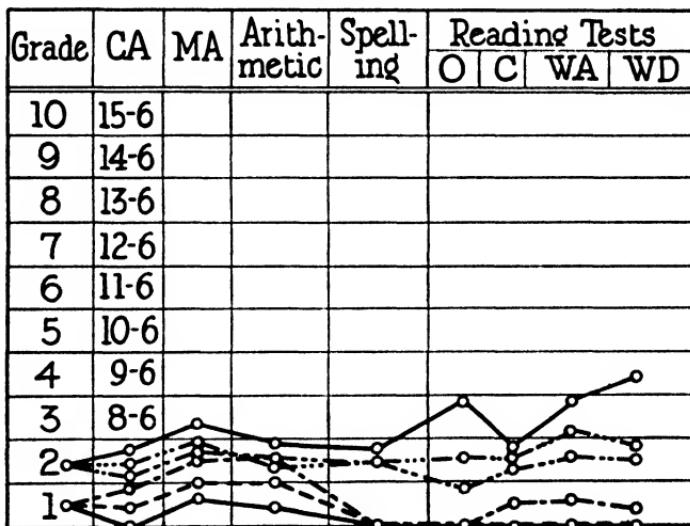


FIG. 39.—Case 34, Dick. Reading index, 0.55 to 1.27

motor co-ordination remains poor and slowness of movement persists. Even in speed of reading, however, Betty is now superior to the standards for her grade.

*Case 34* (Fig. 39).—Dick is a little boy who was six years old at the date of the first examination. He had been in the first grade for three months and had made no progress in reading. He could not recognize even one of the many primer words learned by the other children in the room. He was a very unhappy little boy who begged daily not to be sent to school. The previous year he had loved kindergarten and had made a good social adjustment. He had presented very few problems at home or school until the other children began to read. The results of the remedial instruction are shown in the accompanying tabulation.

CASE 34: TEST SCORES BEFORE, DURING,  
AND AFTER TREATMENT

Test Scores	Nov. 1929	April 1930	Sept. 1930	Dec. 1930	Feb. 1931	June 1931
C.A.....	6-0	6-5	6-10	7-1	7-3	7-7
M.A.....	6-7	(7-0)	(7-6)	(7-9)	(7-11)	(8-4)
I.Q.....	110	(110)	(110)	(110)	(110)	(110)
Gray's Oral Reading Paragraphs.....	1.0	1.0	1.0	1.9	2.6	3.9
Haggerty Reading Examination.....	1.0	1.0	1.5	2.2	2.6	2.6
Iota Word Test.....	1.0	1.0	1.6	2.6	3.1	3.9
Word-Discrimination Test.....	1.0	1.0	1.4	2.6	3.3	4.4
<i>Average reading grade</i> .....	1.0	1.0	1.4	2.3	2.8	3.7
Ayers Spelling Scale.....	1.0	1.0	1.0	2.5	2.5	2.6
Stanford Arithmetic Computation Test.....	1.5	2.0	2.6	2.6	2.5	2.9
(Extrapolated Scores)						
<i>Reading index</i> .....	0.72	0.55	0.60	0.95	1.00	1.27

## ANALYSIS OF READING DISABILITY

Dick is left-handed but prefers the right eye in sighting. His attempts at reading were characterized by many reversals. He was a spontaneous "mirror-writer." He reversed numbers and counted objects by proceeding from the right to the left. He was unable to form any of the associations in the visual-auditory association test. He tried to identify words by small characteristics instead of by the large configuration. Thus, every word presented which contained the letter *i* he read as "jump," mistaking *i* for *j*, and every word which contained the letter *g* he read as "girl," regardless of the position of the *i* or *g* in the word.

His emotional reactions toward reading were manifested in the test, as he hung his head and pushed away all the reading material that was presented. Many different methods of approach were tried before his co-operation could be obtained.

## RESULTS OF TREATMENT

It was evident by June that Dick was not learning to read. He was becoming more seriously retarded as the year progressed. His reading index decreased from 0.72 to 0.55. Remedial training by kinesthetic and phonetic methods was then begun and continued in daily half-hour periods during the summer. By September he could identify the sounds of isolated letters could blend them in word-building, and could read simple phonetic stories. A quotation from a letter reporting his progress follows:

Dick has done very well in reading this summer, but it is still hard work for him. In spite of this fact, he has persisted in taking a lesson each morning. We feel that he has progressed considerably.

In September he was placed with a teacher who gave further intensive remedial work.

In February an extract from a letter reporting progress states:

I have most encouraging news of Dick's progress. The reading lessons, and reading, have noticeably ceased to be the very hard work that they were last Fall. They now have fallen into the category of ordinary tasks.

In June the final examination showed a total gain of 2.7 years in achievement, and an increase of 0.72 points in reading index. Dick's reading at the

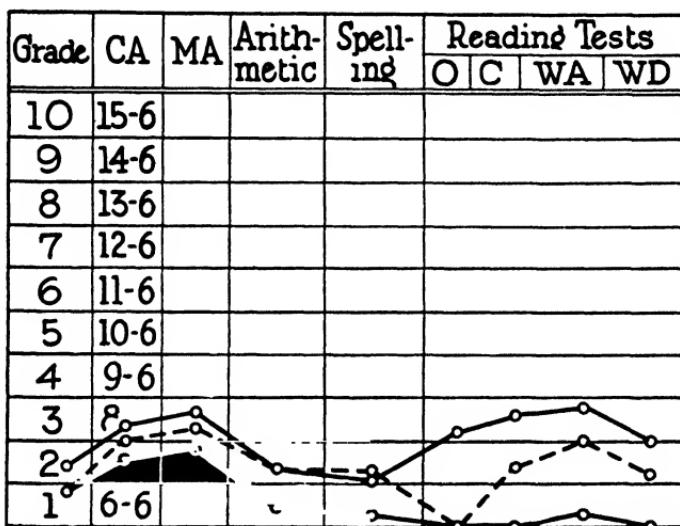


FIG. 40.—Case 35, Mary. Reading index, 0.53 to 0.99

last examination was accelerated for his age. His emotional reaction toward reading had changed from dislike to enjoyment. He showed pride in his accomplishment and an unusual perseverance in attack on hard words. He would not give up, but successfully worked out many of the longer poly-syllabic words in the sixth and seventh paragraphs of Gray's Oral Reading Test. He smiled with an air of confidence and satisfaction when praised for his careful work. From an unhappy, apprehensive little boy who felt his inferiority keenly, he had changed to a competent child who took satisfaction in doing his work well, and from a failing pupil who had not learned to recognize a single word after several months in school, he had changed to a satisfactory pupil, whose achievement was superior for his grade.

*Case 35* (Fig. 40).—Mary is a little girl of average intelligence who was repeating the first grade for the third term when she was examined. The results of the remedial instruction are shown in the accompanying tabulation.

CASE 35: TEST SCORES BEFORE, DURING,  
AND AFTER TREATMENT

Test Scores	Jan. 1931	June 1931	Sept. 1931
C.A. ....	7-7	8-0	8-3
M.A. ....	7-10	(8-3)	(8-5)
I.Q. (Stanford-Binet) ....	103	(103)	(103)
Gray's Oral Reading Paragraphs ....	1.0	1.0	3.1
Haggerty Reading Examination ....	1.0	2.5	3.6
Iota Word Test ....	1.2	3.0	3.8
Word-Discrimination Test ....	1.0	2.1	3.0
<i>Average reading grade</i> ....	1.1	2.2	3.3
Ayers Spelling Scale ....	1.3	2.3	2.1
Stanford Arithmetic Computation Test	1.5	2.4	2.4
(Extrapolated Scores)			
<i>Reading index</i> ....	0.53	0.84	0.99

## ANALYSIS OF READING DISABILITY

Mary's reading at the first examination was characterized by excessive vowel errors, consonant errors, reversals, addition of sounds, omission of sounds, and refusals.

Contributing to the reading disability was an articulatory speech defect which consisted of omissions of endings of words and some substitution of consonants. The speech defect had previously been a severe one, but the child had received speech-training from a specialist during the year in kindergarten. Only a slight residual modification of some of the sounds was present at the age of seven. She had extreme difficulty in the sound-discrimination test, however. Word pairs which were pronounced for her she failed to discriminate. "Bud, but"; "dime, dine"; "hunts, huts," etc., were "just alike" to her. She also failed to associate visual and auditory symbols readily and could not combine sounds in word-building.

She was a pathetic little girl with an apologetic manner and an inclination to weep at any mention of reading or of her school failure. She presented no behavior difficulty at school other than timidity.

She is right-handed but writes equally well with the left hand. There is no history of change of handedness. She prefers the left eye in sighting. She spontaneously wrote "mirror-writing" during the first year at school.

## RESULTS OF TREATMENT

Remedial instruction in reading was given in twenty- or thirty-minute periods several times weekly. A total of thirty hours of treatment was given in all. Mary made a gain of 2.2 years in reading achievement during the remedial work and an increase in reading index from 0.53 to 0.99. The latter index indicates average reading achievement.

On returning to school in September she was placed in the high second grade. She was elated over "skipping a grade," but said anxiously, "Oh, I hope I won't be dumb again!" She appears much happier and less timid

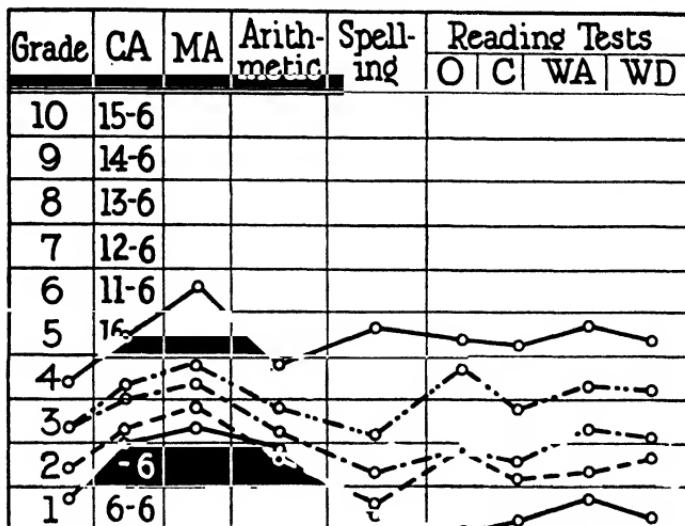


FIG. 41.—Case 36, Clifford. Reading index, 0.46 to 0.94

CASE 36: TEST SCORES BEFORE, DURING,  
AND AFTER TREATMENT

Test Scores	Nov. 1928	March 1929	Nov. 1929	April 1930	June 1931
C.A.....	8-0	8-4	9-0	9-5	10-7
M.A.....	8-4	(8-8)	(9-5)	(9-10)	11-8
I.Q. (Stanford-Binet).....	105	(105)	(105)	(105)	111
Gray's Oral Reading Paragraphs.....	1.0	2.9	2.9	4.7	5.4
Haggerty Reading Examination.....	1.3	2.1	2.5	.....	.....
Monroe Silent Reading Test.....	.....	.....	.....	3.8	5.2
Iota Word Test.....	1.8	2.3	3.6	4.4	5.8
Word-Discrimination Test.....	1.4	2.6	3.1	4.2	5.3
Average reading grade.....	1.4	2.6	3.0	4.3	5.4
Ayers Spelling Scale.....	1.3	1.5	2.3	3.1	5.7
Stanford Arithmetic Computation Test.....	2.9	2.6	3.1	3.9	4.8
Reading index.....	0.46	0.81	0.81	0.98	0.94

than before the remedial work although she still remains at the edge of the group, watching rather than participating in social activities.

Case 36 (Fig. 41).—Clifford is an eight-year-old boy who stutters and who has many behavior difficulties. When first examined he was antisocial,

kicking, biting, hitting other children on the playground, disturbing the school by talking excitedly, making faces, running around the room, and resisting authority. Outside of school he set fires and was a neighborhood menace. He terrified persons passing on the street by walking the open railing of the front porch of a third-floor apartment. Many of the factors in his case antedated the reading disability and were problems for psychiatric study. We were interested in attempting remedial instruction, however, because of the related speech and reading defects, and because, in spite of incorrigible behavior, he had made normal progress in arithmetic. Had the reading disability been due only to the behavior disorders, we should have expected a general rather than selective retardation in achievements. The results of the remedial instruction are shown in the accompanying tabulation.

#### ANALYSIS OF READING DISABILITY

Clifford's errors in reading were excessive only in reversals and repetitions. He was right-handed but left-eyed. During the mirror-reading test he showed no stuttering, although he stuttered profusely in reading without the mirror.

He was able to discriminate the speech sounds and blend them in word-building with average facility.

The time devoted to the reading lesson at school was one which he frequently used for the display of his antisocial behavior.

#### RESULTS OF TREATMENT

The remedial instruction in reading was given in two different series: the first between November, 1928, and March, 1929; and the second between November, 1929, and April, 1930. During the first series of lessons he advanced 1.2 years in reading achievement, and made a gain of 0.35 points in reading index. During the next eight months without special work, his reading index remained the same. Under the second series of lessons he progressed 1.3 years, and gained 0.17 points in reading index. At the latter examination his reading achievement was satisfactory for his expectation. A year later he was re-examined and progress had continued normally. At the last examination the Stanford-Binet Intelligence Test was repeated with a gain of 6 points, which gave him a rating of superior rather than average intelligence. This last rating increased the expectation in reading, and resulted in a loss of a few points in reading index.

Clifford's stuttering gradually decreased, and was not present at all during the last two examinations. The sounding-tracing and finger-pointing methods seemed effective in preventing stuttering during reading. The pages which he read while following the text manually, or by writing while reading, were noticeably free from stuttering.

There has been a general improvement in his behavior and social adjust-

ment although his excitability persists. In line with his personality, it is interesting to note that his taste in reading runs to the highly imaginative tales of adventure.

Clifford's case, complicated as it was by many problems, illustrates the necessity of combined approach from many aspects—psychiatric, psychological, and social. With such co-operative treatment, a satisfactory educational adjustment has been made by a child who presented difficult personality and behavior problems as well as specific disabilities in speech and reading.

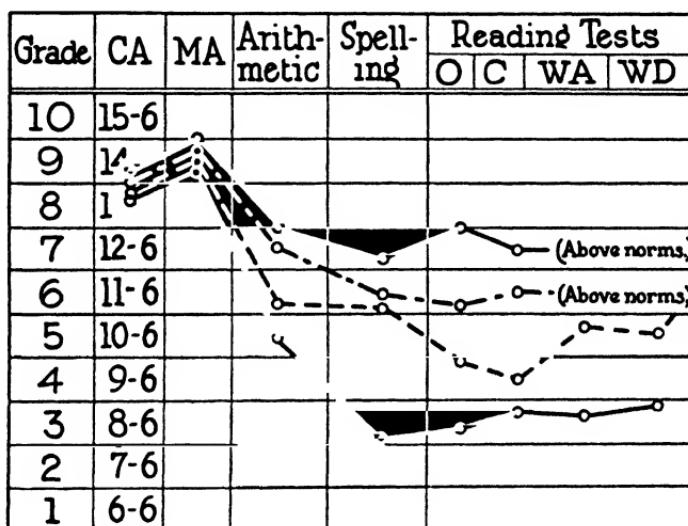


FIG. 42.—Case 37, Charlotte. Reading index, 0.46 to 0.83

*Case 37* (Fig. 42).—Charlotte was thirteen years of age when she was first examined. She had started to school at the usual age, but after a number of grade repetitions and general unhappy experiences at school was considered to be defective in intelligence. On the basis of this conclusion she was removed from public school, and placed in a private school for defective children. She remained in this school for four years, until the date of the first examination. At that time she had refused to return to school, laid down the ultimatum that she did not intend to go to school again, and was prepared to defend her position with all the resistance of body and spirit. She was brought to the examination under pressure, and when the reading tests were presented she refused to co-operate, saying, "So this is what they brought me here for! Well, you might just as well mark me zero and go on." An explanation of reading disabilities was then given to her, showing her how they may occur in bright children, and assuring her that she was not

necessarily dumb just because she could not read. After giving the Stanford-Binet Intelligence Test, the examiner said, "You see, Charlotte, these tests make me know that you are a bright girl. A dumb one could not pass them. You are only thirteen years old, yet you succeeded with some of the tests for fourteen- and sixteen-year-old people." She seemed pleased for a moment or two, as if wishing to be convinced, and then retorted, "But these tests don't count. They don't make any difference. It's whether or not you can read that tells how bright you are." Co-operation was finally established, however, and the reading tests were completed. The results of the remedial instruction are given in the accompanying tabulation.

CASE 37: TEST SCORES BEFORE, DURING,  
AND AFTER TREATMENT

	Sept. 1929	Nov. 1929	Feb. 1930	June 1930	Dec. 1930
C.A.....	13.7	13.9	14.0	14.4	14.10
M.A.....	14.3	(14.5)	(14.8)	(15.0)	16.8
I.Q. (Stanford-Binet).....	105	(105)	(105)	(105)	112
Gray's Oral Reading Paragraphs.....	3.3	4.9	6.1	8.0	8.0
Haggerty Reading Examination.....	3.6	4.5	.....	.....	.....
Monroe Silent Reading Test.....	.....	.....	6.5	7.4	7.7
Stanford Achievement Reading Test.....	.....	.....	6.5	7.4	7.7
Iota Word Test.....	3.6	5.8	.....	Above norms	.....
Word-Discrimination Test.....	3.9	5.7	5.7	.....	Above norms
Average reading grade.....	3.6	5.2	6.2	7.6	7.8
Ayers Spelling Scale.....	3.1	6.1	6.3	7.4	Not given
Stanford Arithmetic Computation Test.....	5.3	6.1	7.5	8.0	Not given
Reading index.....	0.46	0.63	0.70	0.83	Not obtained

ANALYSIS OF READING DISABILITY

Charlotte's reading showed an excessive number of errors in consonants, reversals, addition of sounds, omission of sounds, repetition, and addition of words.

She was a fluent mirror-reader and mirror-writer. She was right-handed, but preferred the left eye in sighting. She had great difficulty in forming visual-auditory associations, and in blending sounds in word-building. She was never secure in recognition of complex word patterns although she recognized the individual letters of words easily.

Related to the reading disability was a pronounced emotional reaction. She believed herself to be defective and was resistant to any attempt at further education.

## RESULTS OF TREATMENT

Because of Charlotte's emotional resistance to school, and because of her severe retardation which made her a misfit in any grade, we advised that she be taken out of school altogether and that a trained tutor give the remedial work in reading. A second tutor was employed to work with her in arithmetic, history, geography, and content subjects. For nine months, therefore, her education was given individually, and the special work in reading was carried out daily for hour or hour-and-a-half periods. She proved to be a satisfactory pupil from the standpoint of attitude and effort, but the reading disability was an extreme one which required hours of patient, repetitive drill for each step of improvement obtained.

Charlotte gained 4.0 years in reading achievement and increased 0.37 points in reading index, from September to June. At the June examination, all her achievements indicated seventh or eighth grade. The following September she entered an eighth-grade class from which she graduated creditably at the end of the school year. An extract from a letter reporting her progress is given below:

Charlotte has enjoyed her year immensely. She seems to feel that the world is made for her and that she is well able to cope with it. She just seems jubilant. . . .

During Christmas vacation Charlotte returned for further tests, at which time the Stanford-Binet Intelligence Test was repeated. She earned an I.Q. of 112 and a rating of superior intelligence. The psychologist giving the tests reported as follows:

I believe the discrepancy between the two tests is due to two factors. First, the relief of emotional tension and apprehension permitted Charlotte to do herself greater justice in dealing with the test material than at the first test, and second, the improvement in reading ability permitted her to pass the tests involving reading and which were previously failed. The latter examination is, I think, a better rating of her true capacity.

Charlotte entered high school in September, 1931, where she has spent several weeks to date, making a good adjustment. Her attitude toward work has been excellent. An illustrative incident follows. She was recently invited out during the week but refused, saying, "Oh, I spend my evenings studying. I never go places except on week-ends. You see, I want to make good grades this year. It's very important to get a good start." This—from a child who two years before had refused to go to school again, and whose history includes several years in an institution for defective children!

Qualitatively, Charlotte's reading retains some of the aspects of her disability. Although she is able now to read with comprehension any material needed for her courses, she occasionally has to resort to sounding or tracing as a method of word-recognition. Small words such as "was," "saw," "had," "and," "this," etc., sometimes confuse her. Her reading, therefore, has a slightly irregular speed quality characterized by periods of comparative

facility and periods of blocking in which the separate words must be studied. Hence, she hesitates to read aloud before strangers. High-school work, however, requires little oral reading, and in silent reading her method of attack is not apparent.

*Case 38 (Fig. 43).*—Hugh was twelve years old and failing in the sixth grade when he was first examined. He resented the examination and scowled all the way down the hall to the testing-room. After the test started he was easily won over by the examiner's friendliness. He became communicative, and explained his failure as follows: "I just get so scared that I can't do

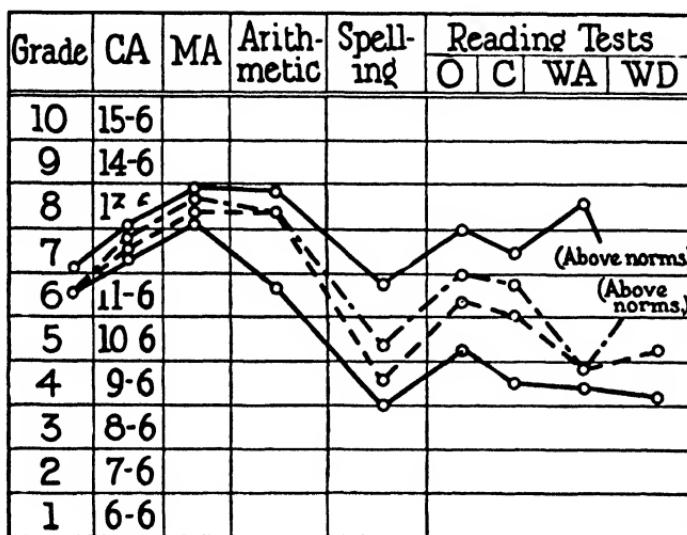


FIG. 43.—Case 38, Hugh. Reading index, 0.62 to 0.92

anything when we have tests. And when we study everybody begins to turn over the pages before I'm through the first paragraph so I know it's no use." His failure at school, his antagonism toward study, and his general unhappiness at school caused anxiety in the home. Many problems of discipline arose which the parents wished to handle intelligently but were at a loss as to the proper tactics to pursue. The results of remedial instruction are given in the accompanying tabulation.

#### ANALYSIS OF READING DISABILITY

Hugh's reading showed excessive errors in the following types: vowels, consonants, addition of sounds, omission of sounds, and repetition.

He was right-handed and right-eyed. He had difficulty in combining the sounds of words in word-building and in distinguishing between words of similar sounds.

Associated with the reading disability was a pronounced resentment toward school accompanied by discouragement and a feeling of hopeless inferiority.

#### RESULTS OF TREATMENT

In the course of nine months' treatment Hugh gained 3.3 years in reading achievement and 0.30 points in reading index. The remedial work was given two or three times a week in hour sittings. In December he had been retarded in reading approximately one and a half years below his grade placement at school. The following September he entered the seventh grade with a reading achievement of 7.9, almost a year in advance of the usual entrance

#### CASE 38: TEST SCORES BEFORE, DURING, AND AFTER TREATMENT

Test Scores	Dec. 1929	March 1930	June 1930	Sept. 1930	Dec. 1930
C.A. ....	12-3	12-6	12-9	13-0	13-3
M.A. ....	13-1	(13-4)	(13-7)	(13-10)	14-8
I.Q. (Stanford-Binet) ....	107	(107)	(107)	(107)	111
Gray's Oral Reading Paragraphs. ....	5.4	6.4	7 0	8 0	Above norms
Monroe Silent Reading Test	4 6	6 0	6 7	7 4	8 0
Stanford Achievement in Reading Test. ....	.....	.....	6 5	8 7	8.9
Iota Word Test. ....	4 5	4 9	4 9	.....	Above norms
Word-Discrimination Test	4 2	5 3	.....	.....	Above norms
Average reading grade. ....	4 6	5 9	6 5	7 9	8.4
Ayers Spelling Scale. ....	4 0	4 5	5 2	6 7	Not given
Stanford Arithmetic Computation Test. ....	6 6	8 5	8 5	8 9	Not given
Reading index. ....	0 62	0 72	0 78	0 92	Not obtained

achievement of 7.0. Since he was placed in a superior school of high scholastic standards, it was necessary for his reading achievement to be accelerated, in order for him to keep up with the other members of the class.

Hugh completed the grade's work creditably and was proud of his accomplishments. He was ambitious and confident of his ability. A repetition of the Stanford-Binet Intelligence Test gave him a rating of superior intelligence. At one of the later conferences with the boy, Hugh described a talk which he had made before the class. The examiner asked, "But weren't you scared?" He replied, "Oh, no. I've done so much during the last year that things like that don't bother me any more."

Hugh's scores on the arithmetic tests improved markedly even though no special work was done in this subject. The improvement in arithmetic seemed to result from his change of attitude and the emphasis on accuracy rather than speed which was developed in the remedial reading work.

*Case 39 (Fig. 44).*—Louis (who is also Case 29 of chap. iv) is a boy who had a birth palsy and marked disturbance in speech. Certain aspects of his

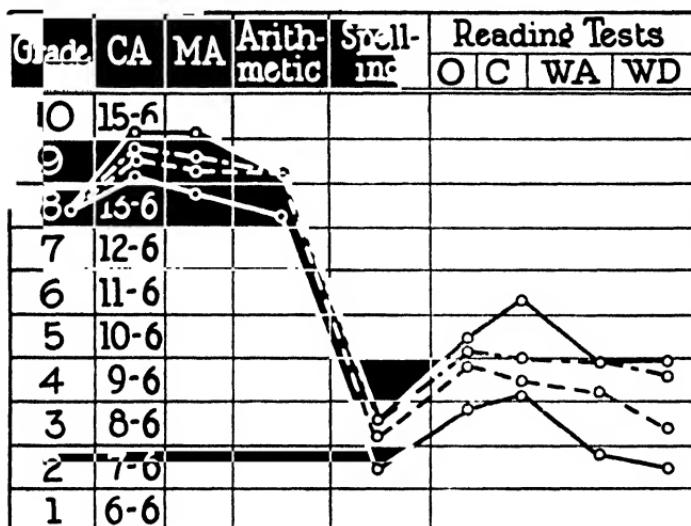


FIG. 44.—Case 39, Louis. Reading index, 0.37 to 0.56

case have been presented previously. The results of the remedial instruction are given in the accompanying tabulation.

**CASE 39: TEST SCORES BEFORE, DURING,  
AND AFTER TREATMENT**

Test Scores	April 1930	Nov. 1930	Feb. 1931	June 1931
C.A. ....	14.1	14.7	14.10	15.3
M.A. ....	13.11	(14.5)	(14.8)	(15.1)
I.Q. (Stanford-Binet) ....	98	(98)	(98)	(98)
Gray's Oral Reading Examination	3.9	4.9	5.1	5.2
Monroe Silent Reading Test	4.1	4.6	5.0	6.5
Iota Word Test	2.9	4.2	4.9	4.8
Word-Discrimination Test	2.6	3.5	4.7	4.9
<i>Average reading grade</i> ....	3.4	4.3	4.9	5.5
Ayers Spelling Scale	2.5	3.4	3.5	3.5
Stanford Arithmetic Computation Test	8.4	9.3	9.3	9.3
<i>Reading index</i> ....	0.37	0.45	0.51	0.56

**ANALYSIS OF READING DISABILITY**

At the first test the excessive errors in reading were vowels, consonants, reversals, addition of sounds, and omission of sounds.

Related to the reading disability was a severe articulatory speech defect, so that Louis could not make himself understood to strangers. The birth injury was diagnosed as a central lesion and the speech disturbance as a residual aphasia. He was right-handed but left-eyed. He was a fluent mirror-reader. He had pronounced difficulty in auditory discrimination of the speech sounds and in blending the sounds in word-building. Because of his conspicuous speech defect he withdrew from social contacts as much as possible.

#### RESULT OF TREATMENT

Much of the remedial work with Louis was a combination of reading and speech-training. The treatment was given usually two hours a week for nine months from September until June. During that time he gained 2.1 years in reading achievement and 0.19 points in reading index.

His reading disability proved to be a severe one and was not completely overcome during the period of treatment. Speech improved greatly during the nine months, and he took more part in group activities than he had in the past. An extract from a letter reporting progress follows:

Louis has shown less hesitancy in meeting people than before the special work. Friends of the family have spoken of his marked improvement. He is more careful of his pronunciation of words although in short answers he seems to lapse back into old habits.

Louis's development in language usage is illustrated by the following samples of spontaneous writing:

*a) Specimen written at the beginning of remedial work:*

when I wos hone one thinkgiven I take my rifle and to hurt rabbit I saw one but nave shot at it I went in sone willon brunch by a ceek and sow rabbit and kill it went up on a hill and sow undown a post and shot it and get it I come on hone by the road and in the deich I saw ome and I shot at it an got it and I had a thinkgiven dinner and a thinkgiven rabbit dinner but nat on thinkgiven.

*b) Specimen written at end of remedial work:*

Barney is a horse. He looks funny because he is white and has a brown side to his face. He is half asleep but he is awake. When a doy [boy] gets on his back he will buck you off when you thought he was asleep. When the water in the tank gets frozen Barney could get the water without help. He goes to the tank and puts one foot in it and uses it for a hammer and gets the water that way.

Although Louis's reading is still retarded for his age, his case illustrates the improvement which can be made in spite of marked speech disturbance associated with a brain lesion. His progress, complicated as it was by the severe language handicap, has been somewhat slower than the progress made by most cases after the same number of hours of treatment. The work, however, has resulted in a much greater educational achievement and a happier social adjustment than would have been possible without the specialized treatment.

*Case 40* (Fig. 45).—Gordon represents a case of severe reading disability in a child of inferior mental capacity as judged by the Stanford-Binet Intelligence Test. The results of the remedial instruction are given in the accompanying tabulation.

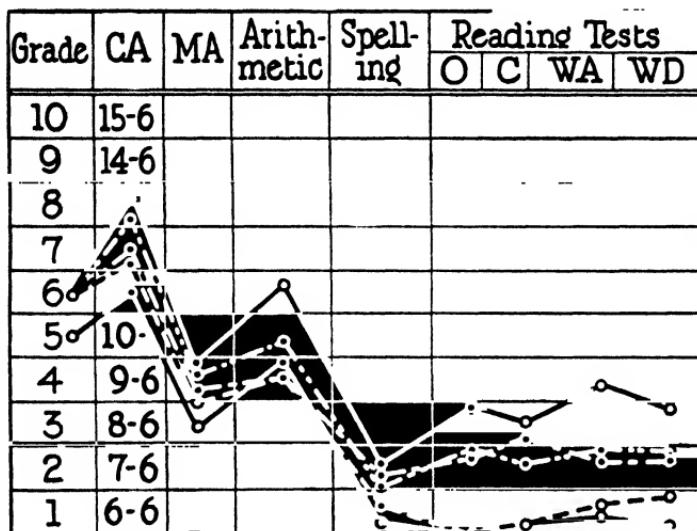


FIG. 45.—Case 40, Gordon. Reading index, 0.26 to 0.60

#### CASE 40: TEST SCORES BEFORE, DURING, AND AFTER TREATMENT

Test Scores	June 1929	Feb 1930	May 1930	Feb 1931	June 1931
C.A. ....	11.6	12.2	12.5	13.2	13.6
M.A. ....	8.6	(0-0)	(0-2)	(0-8)	(0-11)
I.Q. (Stanford-Binet) ....	74	(74)	(74)	(74)	(74)
Gray's Oral Reading Paragraphs ....	1.0	1.0	2.8	2.9	3.9
Haggerty Reading Examination ....	1.3	1.3	3.1	2.5	3.3
Iota Word Test ....	1.5	1.7	2.7	2.8	4.4
Word-Discrimination Test ....	1.4	1.9	2.6	2.9	3.9
Average reading grade ....	1.3	1.5	2.8	2.8	3.9
Ayers Spelling Scale ....	1.3	1.8	2.2	2.1	2.3
Stanford Arithmetic Computation Test ....	4.9	4.6	4.6	5.2	6.7
Reading index ....	0.26	0.28	0.51	0.48	0.60

#### ANALYSIS OF READING DISABILITY

Gordon's reading was characterized by excessive errors in vowels, consonants, reversals, omission of sounds, and words refused.

Gordon was right-handed but left-eyed. He was a fluent mirror-reader and mirror-writer. He had marked difficulty in discrimination of speech sounds and in blending the sounds in word-building.

Related to the reading disability was a feeling of inferiority and a resentful attitude toward school.

Gordon's Stanford-Binet I.Q. is 74 and represents borderline-defective intelligence. On the Arthur Point Performance Test, however, he earned an I.Q. of 111, which gave a rating of superior intelligence.

#### RESULTS OF TREATMENT

Since Gordon's teacher felt no hope for him and did not wish to co-operate in the remedial teaching of a dull child, no remedial work was done between June, 1929, and February, 1930. An aunt tried with a little success to give the boy some help in phonics but no systematic training was arranged until the spring of 1930. He was thereafter given remedial treatment at the Institute, in hour or half-hour periods once or twice a week, for a total of approximately forty-eight hours.

His improvement was rapid during the early and later periods of the remedial instruction. There was, however, a period in the middle portion of the treatment in which there was little measurable gain. Although the remedial work was given patiently and persistently, it seemed, for a while, as if the plateau represented the limit of improvement. A rapid gain followed, however, and at the last examination his reading achievement showed 2.6 years' progress. He had also made a gain of 0.34 points in reading index.

Gordon's mental age, as obtained on the performance test, and his achievement in arithmetic are still far in advance of his reading achievement. Continued remedial instruction is under way in order to determine whether or not it is possible to bring the reading index up to standard.

Gordon's case is presented to illustrate improvement in reading in a boy who had remained a non-reader during six years at school and whose reading disability is associated with a low Stanford-Binet I.Q. As a result of the increased educational achievement, he became more self-confident and improved in attitude toward school.

*Case 41.*—Miss C (who is also Case 30 in chap. iv) was given remedial treatment in reading to determine the progress which could be made in a case of loss of reading ability after encephalitis. Her disability, which has been previously described, consisted of a visual defect (right hemianopsia) and inability to recognize words as units. She could recognize letters with a few inaccuracies, and could determine words by spelling out the letters slowly.

Test scores were not obtained as Miss C's reading was variable under different conditions of speed and attack. Adult material could be read with some degree of accuracy if plenty of time for spelling the words was given. She failed hopelessly on primer material if she attempted to read words as

## BIBLIOGRAPHY

ACKERSON, LUTON. *Children's Behavior Problems*. University of Chicago Press, 1931.

AKIN, FLORENCE. *Word Mastery*. Houghton Mifflin Co., 1913.

ANDERSON, C. J., and MERTON, ELDA. "Remedial Work in Reading," *Elementary School Journal*, XX (May and June, 1920), 685-701, 772-91.

ANDERSON, M., and KELLEY, M. *An Inquiry into Traits Associated with Reading Disability*. "Smith College Studies in Social Work," II, No. 1 (September, 1931).

BARROWS, SARAH T., and CORDTS, ANNA D. *The Teacher's Book of Phonetics*. Ginn & Co., 1926.

BLOM, E. C. "Mirror Writing," *Psychological Bulletin*, XXV (1928), 582-94.

BRONNER, AUGUSTA F. *The Psychology of Special Abilities and Disabilities*. Boston: Little, Brown & Co., 1917.

CARR, HARVEY A. *Psychology*. Longmans, Green & Co., 1925.

CARTER, H. L. J. "Disabilities in Reading," *Elementary School Journal*, XXXI (1930), 120-32.

COMFORT, F. D. "Lateral Dominance and Reading Disability." Paper read before the American Psychological Association, September 11, 1931, Toronto.

DEARBORN, W. F. "Ocular and Manual Dominance in Dyslexia." Paper read before the American Psychological Association, September 11, 1931, Toronto.

DOWNEY, J. E. "Types of Dexterity and Their Implications," *American Journal of Psychology*, XXXVIII (1927), 317-67.

FERNALD, G., and KELLER, H. "The Effect of Kinaesthetic Factors in the Development of Word Recognition in Non-Readers," *Journal of Educational Research*, IV (1921), 355-77.

FILDES, L. G. "A Psychological Inquiry into the Nature of the Condition Known as Congenital Word Blindness," *Brain*, XLIV (1921), Part III, 286-307.

FREEMAN, FRANK N. "Clinical Study as a Method in Experimental Education," *Journal of Applied Psychology*, IV (June-September, 1920), 126-41.

—. "Experiments with School Subjects: Observations of Eye-Movements in Reading," *Experimental Education*, pp. 95-109. Houghton Mifflin Co., 1916.

GATES, A. I. *The Improvement of Reading*. Macmillan, 1929.

—. *Interest and Ability in Reading*. Macmillan, 1930.

—. *The Psychology of Reading and Spelling with Special Reference to Disability*. Teachers College, Columbia University, 1922.

GEIGER, RUTH. "A Study in Reading Diagnosis," *Journal of Educational Research*, VIII (November, 1923), 283-300.

GRAY, WILLIAM S. "Diagnostic and Remedial Steps in Reading," *ibid.*, IV (June, 1921), 1-15.

—. *Remedial Cases in Reading: Their Diagnosis and Treatment*, "Supplementary Educational Monographs," No. 22. Department of Education, University of Chicago, 1922.

HAEFNER, R. *The Educational Significance of Left Handedness*, "Teachers College Contributions to Education," No. 360. New York, 1929.

HEAD, H. *Aphasia and Kindred Disorders of Speech*. Cambridge: University Press, 1926.

—. "Disorders of Symbolic Thinking Due to Local Lesions of the Brain," *British Journal of Psychology* (1921).

HEGGE, THORLEIF G. *Effects of Remedial Reading in Supposedly Feeble-minded Children*, "Särtryck Ur Studier Tillägnade." Lund: Efraim Liljequist, 1930.

HINCKS, ELIZABETH. *Disability in Reading in Relation to Personality*, "Harvard Monographs in Education," Whole No. 7, Ser. 1, Vol. II, No. 2. Cambridge University Press, 1926.

HINSHELWOOD, JAMES. *Congenital Word Blindness*. London: H. K. Lewis & Co., 1917.

HOLLINGWORTH, LETA S. *Special Talents and Defects*. Macmillan, 1931.

HORN, ERNEST. "The Objectives in Reading as a Guide to Remedial and Prophylactic Work," *Second Yearbook of the Department of Elementary School Principals*, II, No. 4 (1923), 287-96.

JUDD, C. H., and BUSWELL, G. T. *Silent Reading: A Study of Various Types*, "Supplementary Educational Monographs," Department of Education, University of Chicago," No. 23.

JUDD, C. H., GRAY, W. S., McLAUGHLIN, K., SCHMIDT, C., and GILLILAND, A. R. *Reading: Its Nature and Development*, *ibid.*, II, No. 4 (1918).

KELLER, HELEN BASS. "The Teaching of Non-Readers," *Third Yearbook of the Psychology and Educational Research Division, Los Angeles City School District*, Pub. 185 (1929).

KIRK, SAMUEL A. *The Influence of Manual Tracing on the Learning of Simple Words in the Case of Subnormal Boys*. Master's thesis, Department of Psychology, University of Chicago. August, 1931.

LASHLEY, K. S. *Brain Mechanisms and Intelligence*. University of Chicago Press, 1920.

—. "Basic Neural Mechanisms in Behavior," *Psychological Review*, XXXVII, No. 1 (January, 1930).

LORD, E. E. *Mental Development of Children with Lesions in the Central Nervous System*, "Genetic Psychology Monographs," VII (1930), 371-486.

LORD, ELIZABETH E., CARMICHAEL, LEONARD, and DEARBORN, WALTER F. *Special Disabilities in Learning To Read and Write*, "Harvard Monographs in Education," Whole No. 6, Ser. 1, Vol. II, No. 1. Cambridge University Press, 1925.

MERTON, ELDA L. "The Discovery and Correction of Reading Difficulties," *Second Yearbook of the Department of Elementary School Principals*, II, No. 4 (1923), 346-63.

MILES, W. R. "Ocular Dominance Demonstrated by Unconscious Sighting," *Journal of Experimental Psychology*, XII (1929), 113-26.

MONROE, MARION. *Methods for Diagnosis and Treatment of Cases of Reading Disability*, "Genetic Psychology Monographs," IV, Nos. 4 and 5 (October-November, 1928).

—. *Suggestions for Remedial Instruction in Reading*. Illinois Institute for Juvenile Research pamphlet. 1929; rev. 1931.

MOSHER, R. M., and NEWHALL, S. M. "Phonic vs. Look-and-Say Training in Beginning Reading," *Journal of Educational Psychology*, XXI (1930), 500-506.

OATES, D. W. "Left-Handedness in Relation to Speech Defects, Intelligence and Achievement," *Forum of Education*, VII (1929), 91-105.

ORTON, SAMUEL T. "An Impediment in Learning To Read—a Neurological Explanation of the Reading Disability," *School and Society*, September, 1928, pp. 286-90.

—. "'Word Blindness' in School Children," *Archives of Neurology and Psychiatry*, XIV (1925), 581-615.

PARSON, B. S. *Left-Handedness*. Macmillan, 1924.

PINTNER, R. "Inner Speech during Silent Reading," *Psychological Review*, XX (1913), No. 1, 129-57.

SCHMITT, CLARA. "Developmental Alexia," *Elementary School Journal*, XVIII (1918), 680-700, 759-69.

SUTHERLAND, A. H. "Correcting School Disabilities in Reading," *ibid.*, XXIII (September, 1922), 37-42.

TERMAN, L. M. *The Measurement of Intelligence*. Houghton Mifflin Co., 1916.

THURSTONE, L. L., and JENKINS, R. L. *Order of Birth, Parent-Age, and Intelligence*. University of Chicago Press, 1931.

TOWN, CLARA H. "Congenital Aphasia," *Psychological Clinic*, V (November, 1911), 167-79.

TRAVIS, L. E. *Speech Pathology*. D. Appleton & Co., 1931.

TRAVIS, L. E., and DAVIS, M. G. *The Relation between Faulty Speech and Lack of Certain Musical Talents*, "Psychological Monographs," XXXVI (1926), 71-81.

WALLIN, J. E. WALLACE. "Congenital Word Blindness—Some Analyses of Cases," *Training School Bulletin*, XVII (September and October, 1920), 76-83, 93-99.

WETMORE, R. G., and ESTABROOKS, G. H. "The Relation of Left-Handedness to Psycho-neurotic Traits," *Journal of Educational Psychology*, XX (1929), 628-29.

WILE, IRA S. "Paper on the Relation of Handedness to Mental Disorders and Disabilities." Presented at the Seventh Annual Meeting of the American Ortho-psychiatric Association, 1930.

WISELEY, W. G. "A Study of the School Progress of Left-handed Children," *Ohio Schools*, April, 1930, p. 144.

WITMER, LIGHTNER. "Congenital Aphasia and Feeble-mindedness—a Clinical Diagnosis," *Psychological Clinic*, X (December, 1916), 181-91.

WOOLEY, H. T., and FERRIS, E. *Diagnosis and Treatment of Young School Failures*, Bureau of Education Bull. 1, Washington, 1923.

ZIRBES, LAURA. "Diagnostic Measurement as a Basis for Procedure," *Elementary School Journal*, Vol. XVIII (March, 1918).



## APPENDIX

### DIRECTIONS FOR GIVING TESTS

In order to allow duplication of our methods by clinical psychologists, directions and norms for the tests described in this study are given here in full.<sup>1</sup> The tests require training for successful administration. Without sufficient preliminary practice the results may be invalidated. Each item of the tests has its technique of giving and scoring which must be mastered by the examiner. The approach to the child is also an important factor in testing cases of reading disability. The examiner should bear in mind the fact that the child who is retarded in reading is about to be asked to read, an act which he cannot do well and toward which he may have a variety of emotional reactions. Tact and ingenuity in obtaining co-operation on the tests is often necessary. It is a good plan for examiners who are just learning the test procedures to practice upon children who are normal readers and who enjoy reading, until the procedures become automatic. The tests then can be given to retarded readers, and the examiner, who has perfected the techniques, may devote attention primarily to obtaining *rapport* with the child.

#### BATTERY OF TESTS USED IN OBTAINING THE EDUCATIONAL PROFILE AND THE READING INDEX

##### 1. INTELLIGENCE TESTS

Obtain the child's mental age from the complete form of the Stanford revision of the Binet-Simon tests. In a few cases we substituted the Kuhlmann revision for the Stanford revision. Although performance tests and other intelligence tests were usually given to the children in order to obtain additional data on intellectual capacities, we used only the Binet tests in our calculations of the reading index.

##### 2. READING TESTS

Give the following series of tests:

- a) *Gray's Oral Reading Paragraphs* (Bloomington, Ill.: Public School Publishing Co.).—In addition to the directions on the sheets accompanying the tests, observe the following points: Begin always with paragraph 1. Record the exact nature of every error by writing the child's mispronunciation phonetically (if not a true word) above the word misread. Aid the child by pronouncing for him those words over which he blocks or hesi-

<sup>1</sup> Monroe, *Diagnostic Reading Tests: Record Blanks, Manual and Materials*. Chicago, Ill.: C. H. Stoelting Co.

tates for fifteen seconds. Continue each child's reading until he makes seven or more errors in each of two successive paragraphs. Record the child's grade score as found in Gray's table of B-scores.

b) *Haggerty Reading Examination, Sigma 1, Test 2* (World Book Co.).—Give the tests according to the instructions in the manual, allowing two minutes' time. The score is the number of correct items minus the number of incorrect items. Since the test does not provide scores in grade-tenths, the tabulation of grade scores shown was devised from our data on the test.

Score	Grade	Score	Grade	Score	Grade
0.....	1.0	7.....	2.7	13.....	3.6
1.....	1.7	8.....	3.0	14.....	3.7
2.....	1.9	9.....	3.1	15.....	3.8
3.....	2.2	10.....	3.2	16.....	4.0
4.....	2.3	11.....	3.3	17.....	4.2
5.....	2.5	12.....	3.4	18.....	4.4
6.....	2.6				

c) *Monroe Silent Reading Test* (Bloomington, Ill.: Public School Publishing Co.).—Give the tests according to instructions given with the blanks. Record the child's grade score as given in the table of B-scores for comprehension. Give the Monroe Silent Reading Test to children who read with third-grade achievement, or above. Give the Haggerty Reading Examination below third grade.

d) *Iota Word Test* (Cards I, II, and III of the Monroe Diagnostic Reading Tests. Chicago, Ill.: Stoelting Co.).—The Iota Word Test consists of the following fifty-three words printed on three cards:

CARD I

dog	on	Jack
dig	saw	tack
dug	of	sack
card	for	wend
cart	who	tend
Carl	how	send

CARD II

blind	done	mare
blond	bone	fare
choke	tar	care
chuck	nip	pardon
spurt	ton	parlor
squirt	gray	target
repast	chew	tarnish
request		

## CARD III

as	form	pig
it	ball	sung
to	pod	bed
left	balk	plea

Present the cards, saying, "Here are some words. What is this word?" Record the child's response exactly. If he gives a jumble of sounds for the word, record the sounds phonetically (e.g., "brap" for "blind"). Encourage the child to try each word by saying, "It doesn't matter whether you get them all right; just try them anyway. You are getting along fine." If the child says that he does not know a word or refuses to attempt it, mark the word as refused and proceed to the next one. Spontaneous corrections are allowed in counting total words right, but the first response counts as an error in the analysis of errors. Do not give the child any aid other than encouragement. The score is the total number of words right.

Score	Grade	Score	Grade	Score	Grade
0.....	1.0	18.....	1.9	35.....	3.1
1.....	1.0	19.....	1.9	36.....	3.2
2.....	1.0	20.....	2.0	37.....	3.3
3.....	1.1	21.....	2.1	38.....	3.4
4.....	1.1	22.....	2.2	39.....	3.5
5.....	1.2	23.....	2.2	40.....	3.6
6.....	1.2	24.....	2.3	41.....	3.7
7.....	1.3	25.....	2.4	42.....	3.8
8.....	1.3	26.....	2.5	43.....	3.9
9.....	1.4	27.....	2.5	44.....	4.0
10.....	1.4	28.....	2.6	45.....	4.2
11.....	1.5	29.....	2.7	46.....	4.4
12.....	1.5	30.....	2.7	47.....	4.5
13.....	1.6	31.....	2.8	48.....	4.7
14.....	1.6	32.....	2.9	49.....	4.9
15.....	1.7	33.....	3.0	50.....	5.2
16.....	1.8	34.....	3.1	51.....	5.5
17.....	1.8				

e) *Word-Discrimination Test* (Cards VII, VIII, IX, X, XI, and XII of the Monroe Diagnostic Reading Tests. Chicago, Ill.: Stoelting Co.).—The Word-Discrimination Test consists of forty-seven words each presented with a series of confusion words or arrangements of letters. The words are printed in a series of six cards. Each word which is to be discriminated is marked "Key" in the following lists, but, of course, is unmarked on the cards presented to the child.

## CARD VII

in	doggie	card (Key)	choir
is	bog	curd	snug
on (Key)	do	cart	song
no	cat	crad	sunk
of	dug	car	sun
o	dot	cards	sung (Key)
only	dog (Key)	show	stung
aw	bad	not (Key)	melk
say	deb	nut	milk (Key)
sawing	ed	rot	mill
was	bet	out	milt
saw (Key)	bend	no	mlik
raw	chair	nots	cows
look	bed (Key)	yes	milking

## CARD VIII

made (Key)	em	over	wit
mad	be	evre	weth
make	meat	every	which
tries	ee	owns	with (Key)
maimed	us	eve	whit
dame	me (Key)	ever (Key)	from
may	my	even	within
trick (Key)	three	match	dall
trich	teer	fir	round
tirck	true	fire (Key)	tall
tick	limb	fine	balls
trickle	tee	afire	all
plays	free	ire	bell
track	tree (Key)	frie	ball (Key)

## CARD IX

tad	park	clam (Key)	sopt
ap	pert	lam	pot
tup	part (Key)	clem	ink
soft	small	slam	spat
tapper	party	shut	spot (Key)
tap (Key)	prat	calm	slot
rap	par	clams	sport

## CARD IX—Continued

tent	blea	tread	perlor
tind	flea	toast	darlor
tenb	play	bread (Key)	parlon
tends	pea	broad	palor
end	plea (Key)	bed	kitchen
work	grant	breaded	parlors
tend (Key)	please	dread	parlor (Key)

## CARD X

month	repanst	quit	sacred
moth	enough	hose	scad
out	repest	squirt (Key)	away
south	repack	squart	ascared
mouths	repast (Key)	spurit	stared
mouth (Key)	perast	squirm	scored
eyes	past	squirts	sacred (Key)
butter	burn (Key)	shoulder	possibile
insects	barn	shonld	possible
betterfly	turn	should (Key)	possible
bufferfly	brun	shod	passable
flutterby	burr	ought	psossible
buttelrfly	burned	chould	possible (Key)
butterfly (Key)	stove	showld	uncertain

## CARD XI

spilt	parse	how	fog
splint	pruse	who (Key)	far
splat	purr	tho	of
split (Key)	change	whose	or
knife	purses	she	form
slit	purse (Key)	ho	the
splick	punse	whoa	for (Key)
has	float	ruler	does
is	flower	inch	one
this	floor (Key)	lure	don't
him	roolf	rude	were
his (Key)	four	rue	bone
she	plank	rule (Key)	down
their	floors	role	done (Key)

## CARD XII

felt	shot	soceity	trilight
lift	short (Key)	society	tiwlighth
lest	shirt	saciety	twilight
let	sort	society (Key)	twilights
bring	shorten	socity	darkness
cleft	high	sochiety	twilight (Key)
left (Key)	shrot	racial	twiligh
embraced	dangerous (Key)	proportion	
embraced	dangrous	protion	
embranced	dangerorous	proporation	
embaced	dungerous	weighed	
embriced	dankerous	porportion	
chivalrous	dagenrous	proportion (Key)	
embraced (Key)	awfully	propordion	

Present the cards in the sequence given. Indicate the first column of words. Say, "Here are some words. One of these words is 'on.' Look at every word in the column and point to the one which is 'on.' Be sure to look at all the words before deciding." Proceed in the same way for each column of words, asking the child to find the key word. Be sure to pronounce the keyword distinctly. In cases where the child says he does not know the word ask him to find the one which is the "best guess." Record the word or arrangement of letters selected for each keyword. The score is the number of words correctly discriminated.

Score	Grade	Score	Grade	Score	Grade
1-7.....	1.0	20.....	2.5	32.....	3.8
8.....	1.2	21.....	2.6	33.....	3.9
9.....	1.4	22.....	2.7	34.....	4.0
10.....	1.5	23.....	2.8	35.....	4.1
11.....	1.6	24.....	2.9	36.....	4.2
12.....	1.7	25.....	3.0	37.....	4.4
13.....	1.8	26.....	3.1	38.....	4.5
14.....	1.9	27.....	3.2	39.....	4.7
15.....	2.0	28.....	3.3	40.....	4.9
16.....	2.1	29.....	3.5	41.....	5.1
17.....	2.2	30.....	3.6	42.....	5.3
18.....	2.3	31.....	3.7	43.....	5.5
19.....	2.4				

f) *Stanford Achievement Test in Reading* (World Book Co.).—Children whose reading achievements were above the norms of any of the previously mentioned tests were given, in addition, the Stanford Achievement Test

in reading. The grade scores thus obtained were included in the average grade score instead of the score on the tests which were above norms.

### 3. ARITHMETIC TESTS

Obtain the child's arithmetic grade score from the Stanford Achievement Arithmetic Computation Test (World Book Co.). In addition to the directions given in the manual for Test 4, make sure that the child can read the words "add," "subtract," "multiply," "divide." If the child cannot read the words, tell him the words at the top of each problem in Test 4. Do not explain the meaning of the term, but make sure that the child is not using a wrong computation process through inability to read.

### 4. SPELLING TESTS

Eighty words were selected from Ayers Spelling Scale and were arranged for Grades I, II, III-IV, V-VI, and VII-VIII. The lists follow:

#### *Oral Spelling*

I-II	III-IV	V-VI	VII-VIII
day	catch	eight	often
eat	black	afraid	stopped
sit	warm	uncle	motion
lot	unless	rather	theater
box	clothing	comfort	improvement
belong	began	elect	century
door	able	aboard	total
yes	gone	jail	mention
low	suit	shed	arrive
soft	track	retire	supply

#### *Written Spelling*

I-II	III-IV	V-VI	VII-VIII
how	watch	knew	assist
stand	dash	remain	difference
bring	fell	direct	examination
tell	fight	appear	particular
ball	buy	liberty	affair
ask	stop	enough	course
way	walk	fact	neither
has	grant	September	local
baby	soap	station	marriage
ran	news	between	further

The score for each list is the percentage of correct words. Score separately the oral and written productions. Begin always with list I-II. If the child

receives a score of 50 or more, give the next higher test. Continue with successive lists until the child receives a score of less than 50. Average the grade scores for each list to obtain the final spelling grade score (see accompanying tabulation showing scores for the different lists).

Score	List I-II	List III-IV	List V-VI	List VII-VIII
0.....	1.0	1.6	2.3	3.4
10.....	1.3	1.8	2.6	3.8
20.....	1.5	2.0	2.8	4.5
30.....	1.7	2.2	3.1	4.7
40.....	1.8	2.5	3.4	5.0
50.....	2.1	2.8	3.7	5.3
60.....	2.3	3.1	4.1	5.7
70.....	2.5	3.5	4.6	6.3
80.....	2.7	4.0	5.5	7.1
90.....	3.1	4.7	6.5	8.5

If the child receives 100 per cent on a list, give him the highest grade on that list unless he would be penalized thereby. The following examples illustrate the methods of scoring the test. A child was given list I-II in written spelling, making a score of 100 per cent. He was then given list III-IV, scoring 70 per cent. He was then given list V-VI, scoring 40 per cent. No further list was given, since 40 is less than the required 50. His grade scores were 3.1 for list I-II, 3.5 for list III-IV, and 3.4 for list V-VI. He would therefore be penalized by including the score 3.1 for list I-II in the average of the scores, because the score 3.1 is less than the scores 3.5 and 3.4. Since he obtained 100 on the list, we assume that he may have had a score at an undetermined point above 3.1. Had he obtained only 90 on the list, however, the score 3.1 would have been included in the average. Another child was given the lists and obtained the following scores: list I-II, 100 per cent, or 3.1; list III-IV, 50 per cent, or 2.8; list V-VI, 20 per cent, or 2.8. This child was not penalized by including the score of 3.1 in the average. He was therefore allowed the credit for the good performance on the first list, and his final average was 2.9.

##### 5. AGE-GRADE SCALE

In transmuting chronological age and mental age into grade-equivalent scores we used a scale which assumes that the child enters school at six and gains one grade for each year of chronological age. The assumption does not take into consideration the average ages actually found in the grades. We did not select an age-grade scale which includes the ages of grade-repeaters in the norms. We desired that any retardation which the child possesses would be apparent and not disguised by a scale which is affected by retardation.

tion (see accompanying tabulation showing grade by years, and grade-tenths by months).

Years	Grade	Months	Grade-Tenth
6.....	1	0.....	0
7.....	2	1.....	1
8.....	3	2.....	2
9.....	4	3.....	3
10.....	5	4.....	3
11.....	6	5.....	4
12.....	7	6.....	5
13.....	8	7.....	6
14.....	9	8.....	7
15.....	10	9.....	8
16.....	11	10.....	8
17.....	12	11.....	9

Obtain the grade unit from the year's scale and the grade-tenth from the month's scale. A child of six years and eight months would have a grade placement of 1.7; a child of ten years and no months would have a grade placement of 5.0, etc.

#### 6. CALCULATION OF THE READING INDEX

Obtain the grade-equivalent scores for the child's chronological age, mental age, and the grade score on the Arithmetic Computation Test. The average of these grade scores is the child's expectancy grade, since we expect his reading to be harmonious with chronological age, mental age, and arithmetic. Obtain the average grade score for the battery of reading tests. The reading index is the quotient obtained by dividing the reading grade by the expectancy grade.

*Example*

CASE: GORDON

	Grade Score
C.A. = 9.1.....	4.1
M.A. = 10.2.....	5.2
Gray's Oral Reading Paragraphs .....	3.2
Haggerty Reading Test.....	2.5
Iota Word Test.....	2.6
Word-Discrimination Test.....	2.0
Stanford Arithmetic Computation Test.....	4.5
Expectancy grade (average of 4.1, 5.2, and 4.5) = 4.6	
Reading grade (average of 3.2, 2.5, 2.6, and 2.0) = 2.6	
Reading index = $\frac{2.6}{4.6} = 0.57$	

The standard deviations and percentile ranks of the reading indices are given in chapter i, Table VII.

### DIRECTIONS FOR SCORING ERRORS IN OBTAINING THE PROFILE OF ERRORS

The child's profile of errors is taken from three sources: the Iota Word Test, Gray's Oral Reading Paragraphs, and the Word-Discrimination Test. Every error made by the child on the three tests is analyzed and classified into the following error-types:

Error-Type	Examples
Faulty vowels.....	these <i>read</i> those
Faulty consonants.....	then <i>read</i> them
Reversals.....	was <i>read</i> saw
Addition of sounds.....	tap <i>read</i> trap
Omission of sounds.....	away <i>read</i> way
Substitution of words.....	lived <i>read</i> was
Repetition.....	the dog <i>read</i> the the dog
Addition of words.....	the dog <i>read</i> the little dog
Omission of words.....	the little dog <i>read</i> the dog
Words refused or aided.....	"I don't know that word."*

\* Aid is given only in Gray's Oral Reading Paragraphs.

In making a tabulation of errors on the Iota Word Test and Gray's Oral Reading Paragraphs follow these instructions:

1. Many pronunciations contain more than one type of error, as "tap" read "track," a faulty consonant and a sound-addition. Count each type found in the mispronunciation.
2. Do not count as a substitution any mispronunciation which has a consonant or vowel identical with the text or which can be related to the text by reversed letters.
3. Mispronunciations due to speech defects or foreign dialects are not counted as reading errors if they occur in spontaneous conversation as well as in reading. For example, "this" read "dis" is not counted as a consonant reading error in an Italian child who consistently says "mudder," "fadder," "den," etc., for "mother," "father," "then," etc.
4. If by simply changing the sequence of letters within a word another true word can be made, as "on," "no"; "form," "from," etc., and if the consonants and vowels are correct for the reversed sequence, count the error only as a reversal.
5. Bear in mind the fact that the comparison made between the word and the mispronunciation is primarily one of sounds. Write the word and its mispronunciation below each other and check carefully sound by sound. *Ch*, *sh*, *ck*, *th*, etc., are single consonants. *Cl*, *bl*, *br*, etc., are blends of two consonants. *Ea*, *igh*, *ough*, etc., are regarded as single vowels.

In making a tabulation of the errors in the Word-Discrimination Test, use the following key to errors. The errors are scored in a different manner from the Gray and Iota tests in that only one error-type is counted for each

word, and a key to the errors is given. The labor of scoring errors is therefore reduced considerably in this test.

1. If the child indicates one of the following, credit him with a vowel error.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
in	mad	tup	moth	splat	lift
dug	my	pert	repest	parse	shirt
curd	over	clem	squart	whoa	saciety
song	weth	spat	scored	far	twilight
say	track	tind	betterfly	has	embriced
bad	true	play	barn	flower	dungerous
nut	fir	broad	showld	role	proportion
melk	bell	perlor	possible	down	

2. If the child indicates one of the following, credit him with a consonant error.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
of	make	rap	south	splick	lest
dot	be	park	repack	punse	sort
cart	even	slam	squirm	the	society
sunk	which	slot	stared	fog	trilight
raw	trich	tent	bufseriesly	him	embraced
bet	free	flea	turn	float	dankerous
rot	fine	tread	chould	rude	propordion
milt	tall	parlon	possible	does	

3. If the child indicates one of the following, credit him with a reversal.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
no	dame	tad	month	split	felt
bog	em	prat	perast	pruse	shrot
crad	evre	calm	spurit	how	society
snug	whit	sopt	sacred	of	tiwlighth
was	tirck	tenb	flutterby	she	embarced
deb	teer	blea	brun	roolf	dagenrous
out	frie	dread	shonld	lure	porprotion
mlik	dall	darlor	pssobile	bone	

4. If the child indicates one of the following, credit him with a sound-addition.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
only	maimed	tapper	mouths	spint	cleft
doggie	meat	party	repanst	purses	shorten
cards	every	clams	squirts	whose	society
stung	within	sport	ascared	form	twilights
sawing	trickle	tends	buttefly	this	embranced
bend	three	please	burned	floors	dangerorous
nots	afire	breaded	shoulder	ruler	proportion
milking	balls	parlors	possibule	don't	

5. If the child indicates one of the following, credit him with a sound-omission.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
o	may	ap	out	slit	let
do	ee	par	past	purr	shot
car	eve	lam	quit	ho	socity
sun	wit	pot	scad	or	twiligh
aw	tick	end	butter	is	embaced
ed	tee	pea	burr	four	dangrous
no	ire	bed	shed	rue	protion
mill	all	palor	possible	one	

6. If the child indicates one of the following, credit him with a substitution.

Card VII	Card VIII	Card IX	Card X	Card XI	Card XII
is	tries	soft	eyes	knife	bring
cat	us	small	enough	change	high
show	owns	shut	hose	she	racial
choir	from	ink	away	the	darkness
look	plays	work	insects	their	chivalrous
chair	limb	grant	stove	plank	awfully
yes	match	toast	ought	inch	weighed
cows	round	kitchen	uncertain	were	

Summate the errors made by the child on the three tests—Gray's Oral Reading Paragraphs, Iota Word Test, and Word-Discrimination Test—for each error-type. The totals thus obtained constitute the raw profile of errors. Obtain the proportionate scores from Table VIII and the *z*-scores from Tables IX–XIX in chapter iii.

An example is given to illustrate the complete process of analyzing errors, and obtaining the final profile of errors. The child who made the errors shown had a severe reading defect, reading index 0.42 and a reading-grade achievement of 1.9.

#### *Errors Made in the Iota Word Test*

Text	Mispronunciation	Analysis
dig.....	big	reversal
dug.....	bug	reversal
card.....	cape	vowel, omission of sound, reversal
on.....	no	reversal
who.....	no	consonant, vowel
tack.....	take	vowel
sack.....	stick	addition of sound, vowel
blind.....	blend	vowel
blond.....	blownd	vowel
choke.....	shuck	consonant, vowel
spurt.....	spurd	consonant

Text	Mispronunciation	Analysis
squirt.....	spring	reversal, consonant, vowel
repast.....	paste	omission of sound, vowel
request.....	push	reversal, vowel, consonant, omission of sound
done.....	doan	vowel
tar.....	tare	vowel
nip.....	pear	reversal, vowel, consonant
ton.....	not	reversal
chew.....	show	consonant, vowel
pardon.....	carbon	consonant, reversal
parlor.....	carbor	consonant
tarnish.....	tripe	vowel, consonant, omission of sound
as.....	ass	consonant
farm.....	torn	consonant, vowel
ball.....	bale	vowel
pod.....	bode	reversal, vowel
sung.....	spring	addition of sound, vowel
plea.....	please	addition of sound

*Errors Made in Gray's Oral Reading Paragraphs*

Text	Mispronunciation	Analysis
<b>Par. 1:</b>		
L. 4 He.....	the	consonant
wanted...	went	vowel, omission of sound
go.....	the	substitution
5 would not.	wouldn't	omission of sound
6 The little boy...	The boy	omission of word
7 without.....	blocked over word for 15 seconds	word aided
my.....	why	consonant
8 boy.....	dog	reversal, vowel, addition of sound
<b>Par. 2:</b>		
L. 1 Once there was....	Once there	two repetitions
little pig....	Once there was little pig	
2 with.....	little pig	two repetitions
3 saw.....	little pig	
his four feet.....	where	consonant, reversal, vowel
	was	reversal
	his four feet	three repetitions
	his four feet	

Text	Mispronunciation	Analysis
4 Mother, he said . . .	Mother he said he said	two repetitions
what . . . . .	blocked over word for 15 seconds	word aided
5 my feet . . . . .	my four little feet	two word-additions
6 pig . . . . .	bug	vowel, reversal
7 round . . . . .	around round . . . . .	addition of sound addition of sound
8 pen . . . . .	barn	reversal, vowel, addition of sound

*Errors Made in the Word-Discrimination Test*

Keyword	Word Chosen by Child	Analysis
card . . . . .	crad	reversal
bed . . . . .	deb	reversal
milk . . . . .	melk	vowel
made . . . . .	mad	vowel
ever . . . . .	evre	reversal
with . . . . .	whit	reversal
trick . . . . .	trickle	addition of sound
fire . . . . .	fir	vowel
ball . . . . .	dall	reversal
part . . . . .	prat	reversal
clam . . . . .	clem	vowel
tend . . . . .	tind	vowel
plea . . . . .	play	vowel
bread . . . . .	bed	omission of sound
mouth . . . . .	month	reversal
repast . . . . .	repest	vowel
squirt . . . . .	squirts	addition of sound
butterfly . . . . .	betterfly	vowel
burn . . . . .	turn	consonant
possible . . . . .	passable	vowel
split . . . . .	splint	addition of sound
purse . . . . .	purses	addition of sound
who . . . . .	how	reversal
his . . . . .	has	vowel
rule . . . . .	ruler	addition of sound
left . . . . .	lest	consonant
short . . . . .	sort	consonant
society . . . . .	soceity	reversal
twilight . . . . .	darkness	substitution
dangerous . . . . .	dangrous	omission of sound
proportion . . . . .	propordion	consonant

## Final Tabulation of Errors

Error-Type	Raw Profile of Errors*	Proportionate Score for 500 Words†	<i>z</i> -Scores‡
Faulty vowels.....	34	86	+4.0
Faulty consonants.....	19	48	+2.2
Reversals.....	24	61	+4.4
Addition of sounds.....	12	31	+0.7
Omission of sounds.....	8	20	+1.0
Substitution.....	2	5	0.0
Repetition.....	9	23	+0.6
Addition of words.....	2	5	+0.3
Omission of words.....	1	3	+0.3
Words refused and aided.....	2	5	-0.7
Total errors.....	113	287	+2.3

\* Obtained by counting the number of each type of error made on the three tests.

† Obtained from Table VIII, chap. iii. Column 2 is used in the table because the child read two paragraphs in Gray's test.

‡ Obtained from Tables IX-XIX in chap. iii according to instructions given in chap. iii. In this case the child's reading grade taken from the four tests was 1.9.

*Interpretation.*—The error profile given herewith indicates extreme deviations from the mean of unselected children in reversals and vowels, marked deviations in consonants and total errors, and a slight deviation in omissions of sounds. All other error-types fall approximately within the P.E. range (i.e.,  $\pm .6745$  *z*-score) and may be regarded as normal.

## DIRECTIONS FOR GIVING THE SUPPLEMENTARY TESTS

I. MIRROR-READING TEST<sup>1</sup>

The materials for giving the test consist of a small mirror (about 5×8 in. in dimension) with a folding stand for holding it upright, and the *Searson and Martin Primer* (Chicago, Ill.: University Publishing Co.). The text to be read from the mirror is found on page 82 and is as follows:

Once there was a little girl. She had a pretty little doll. One day the doll was lost. The little girl said, "Where is my dolly?" "I can not find her, Mother. Did you take my dolly?" Mother said, "No, I did not take your dolly."

Arrange the book with text facing the mirror. The child in looking over the top of the book into the mirror should have a clear image of the reversed text. Say, "Did you ever try to read from a mirror? It is fun to try. Let's see how well you can do it." The examiner indicates the beginning of the first sentence. "Do you see there in the mirror where my pencil is pointing? Begin right there and read the whole page." If the child hesitates for fifteen

<sup>1</sup> Marion Monroe, *Methods for Diagnosis and Treatment of Cases of Reading Disability* "Genetic Psychology Monographs" (Clark University Press), Vol. IV, Nos. 4 and 5, Oct.-Nov. 1928.

seconds over a word, say, "Just skip that word and go on." No aid is given. Record time and errors.

## NORMS

	Reading Grade	Interquartile Range of Normal Readers	Fluency Greater than 75 Per Cent Normals	Fluency Greater than 90 Per Cent Normals
Time for reading passage.	1	Incomplete-234"	233"-219"	218" or less
	2	265"-122"	121 - 75	74 or less
	3	210 - 115	114 - 89	88 or less
	4	325 - 150	140 - 90	89 or less
Errors in reading passage	1	Incomplete-23	22-18	17 or less
	2	21-7	6-3	2 or less
	3	14-4	3-1	0
	4	19-4	3-1	0
Ratio of mirror-reading to normal time*.....	1	Incomplete-1.7	1.6-1.3	1.2 or less
	2	7.9-3.2	3.1-1.5	1.4 or less
	3	7.9-4.4	4.3-2.7	2.6 or less
	4	10.0-8.0	7.9-5.3	5.2 or less

\* Obtained by dividing time for reading the passage in mirror by time for reading par. 2 of Gray's Oral Paragraphs.

2. MIRROR-WRITING TEST<sup>1</sup>

The test words which are to be written in mirror-writing are "man," "cat," "see," "boy," "dog." The examiner should practice until he can write the words easily in mirror-writing. The words should appear as in Figure 46. Say to the child, "I am going to write some words for you, only I am going to write them backward. I'll begin here [indicating the right-hand side of the paper] and go back in this direction [indicating toward the left]."

*man*

*see*

*cat*

*boy*

*dog*

FIG. 46.—Test words used in mirror-writing. The child is allowed unlimited time and may make spontaneous corrections.

<sup>1</sup> *Ibid.*

## NORMS

Reading Grade	Interquartile Range of Normal Readers	Fluency Greater than 75 Per Cent of Normals	Fluency Greater than 90 Per Cent of Normals
1.....	0-3	4-5	6 or more
2.....	3-8	9-10	11 or more
3.....	4-9	10-12	13 or more
4.....	5-9	10-12	13 or more

## 3. AUDITORY WORD-DISCRIMINATION TEST

Say to the child, "I am going to say some pairs of words. Sometimes the words will be the same, and sometimes they will be different. You tell me after each pair whether you think the words are the same or different. 'Was—was,' yes, they are the same. 'Run—ran,' no they are not the same; they are different. Listen carefully." Turn the child's chair so that he cannot see the examiner's lips. Pronounce the following pairs of words and have the child respond "same" or "different." Articulate clearly but be careful to give no special emphasis to the pairs.

tim.....	tim	bit.....	bet
tap.....	tip	ocean.....	ocean
send.....	sand	pound.....	pond
rain.....	rain	hunts.....	huts
bud.....	but	buttercup.	cupperbut
out....	out	chin.....	shin
shall.....	shall	wonderful.	wonderful
butterfly..	flutterby	cashing.....	catching
dime....	dine	swing.....	sling
glad..	glad	trot.....	trot

*Norms.*—The score is the number of errors made. Normal performance (interquartile range of unselected first-grade children) is indicated by 0-2 errors. Difficulty in discrimination is indicated by 3-5 errors. Six or more errors indicate extreme difficulty in discrimination.

## 4. VISUAL-AUDITORY LEARNING TEST

Five nonsense syllables are to be associated with five nonsense forms (see Fig. 47). Say, "Here are some cards with some funny figures on them. Each figure has a funny name. I will show the figure and tell you its name. Listen carefully and try to remember the names. [Place Card 1 before child.] See this. This is *ree*. [Allow five seconds. Remove and place Card 2 before child.] See this. This is *soo*. [Allow five seconds. Remove and place Card 3 before child.] See this. This is *md*. [Proceed in the same manner for *fs* and *kl*.] Now, let's see how many you can remember. What is the name of this one?" etc. Ask for recall of the cards in the same order as presented. Each correct

association gives a score of 1. Give three trials, presenting cards and names in the same procedure each time as before. The final score is the total number of correct associations in the three trials. The maximum score is 15.

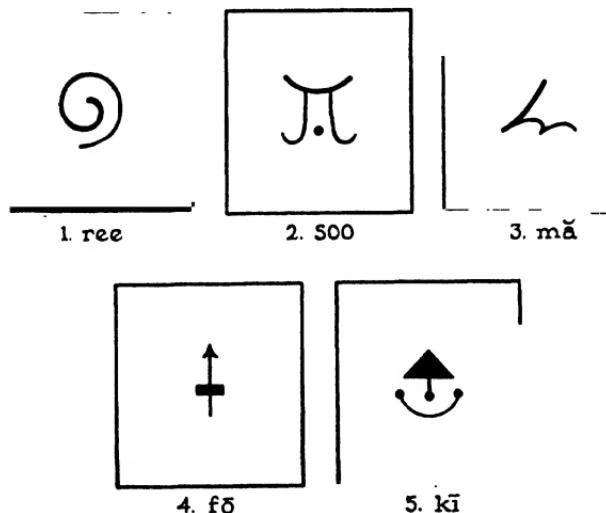


FIG. 47.—Figures used in visual-auditory learning test

*Norms.*—Scores 6-10 indicate normal performance (interquartile range of unselected first-grade children). Scores 2-5 indicate difficulty in forming visual-auditory associations. Scores 0-1 indicate extreme difficulty in forming visual-auditory associations.

##### 5. SOUND-BLENDING TEST

Say to the child, "Now I am going to tell you the sounds of a word. Listen carefully and tell me what the word is." If the child fails to comprehend the instructions, demonstrate with the sounds of the first word, "shoe." "Listen: sh - oe, sh - oe, 'shoe.' Do you hear how sh - oe makes 'shoe'?" Articulate the sounds clearly, in the correct sequence, and with a distinct pause between each sound. Proceed at the rate of two sounds a second.

##### Test Words

sh - oe	r - u - n	b - a - b - ie - s
m - e	t - r - ai - n	m - a - k - i - ng
g - o	l - i - u - le	s - e - c - r - e - t
c - a - n	b - r - ow - n	m - y - s - e - l - f
t - o - p	p - a - r - t - y	g - o - l - d - e - n

The score is the number of words blended correctly from their sounds.

## NORMS

Reading Grade	Interquartile Range of Unselected School Children	Indicates Difficulty in Sound-blending Worse than 75 Per Cent Normals	Indicates Extreme Difficulty in Sound-blending Worse than 90 Per Cent Normals
1.....	11-6	5-3	2 or less
2.....	12-8	7-5	4 or less
3.....	12-8	7-5	4 or less
4.....	12-9	8-6	5 or less
5.....	13-10	9-8	7 or less

## 6. HANDEDNESS TESTS AND EYEDNESS TESTS

The series of tests for hand-and-eye preference which are described in chapter V may be supplemented by a variety of additional tests in those cases in which determination of preference is doubtful. Since much of the remedial instruction in reading necessitates manual responses, it is advisable to determine the child's more facile hand before beginning training.



## INDEX

Ackerson, Luton, vii, 5, 92, 98  
Age-grade scale, 189  
Anderson, M., and Kelley, M., 80, 82, 100, 103, 104  
Aphasia, 71, 81, 173  
Arithmetic, 12, 13  
Attention, 113  
Auditory acuity, 95, 106  
aspects of reading, 106  
discrimination, 93, 94, 106, 107  
learning, 95  
Word-Discrimination Test, 198  
Ayres Spelling Scale, 188  
Behavior problems, 102, 110  
Behavior Research Fund, vii, 1  
Braille, 128  
Carr, H. A., 91, 113  
Chronological age, 8, 9  
distributions of, 3, 4  
Comfort, F. D., 83  
Comprehension, 136  
Conceptual aspects of reading, 108  
Concert-reading method, 133, 134  
Consonants, 35, 45, 116  
Context, 126, 132  
Dearborn, W. F., 83  
Durrell, D. D., 69  
Educational profiles, 111  
of children having average intelligence, 23  
of children having inferior intelligence, 25  
of children having superior intelligence, 18  
showing discrepancies between the reading skills, 29  
use of, in selecting cases, 33  
Emotional aspects of reading, 105, 110  
Environmental factors in reading, 100  
Errors; *see* Reading errors and Profile of errors  
Eyedness; *see* Hand-and-eye preferences  
Fernald, G., and Keller, H., 116  
Gates, A. I., 94, 116  
Gray, W. S., viii, 116  
Gray's Oral Reading Paragraphs, 6, 18, 34, 182  
Group instruction, 154-56  
Haggerty Reading Examination, 6, 18, 183  
Hand-and-eye preferences  
and directional responses, 84  
and mirror-reading, 88  
and mirror-writing, 88  
ratio of facility of the two hands, 90  
and reading defects, 85  
and reversals, 86  
tests for determining, 84, 200  
Handedness, change of, 89  
Head, H., 81  
Hemianopsia, 106  
Hinshelwood, J., 81  
Individual instruction, 114  
Institute for Juvenile Research, vii, 1, 2, 80, 92, 99, 101, 137, 138  
Intelligence quotients  
distributions of, 3, 5  
and reading indices, 17  
Iota Word Test, 7, 18, 34, 183  
Jenkins, R. L.; *see* Thurstone, L. L.  
Kelley, M.; *see* Anderson, M.  
Kelley, Truman, 51  
Kuhlmann-Binet Test, 4, 182  
Lashley, K. S., 81, 82  
Left-handedness; *see also* Hand-and-eye preferences  
among parents and siblings, 89  
Manual-tracing method, 119, 120  
Meaning, 99, 108  
Mental age, 10, 11  
distributions of, 3, 4  
Methodological factors in reading, 101, 109  
Mirror-reading; *see also* Hand-and-eye preferences  
test for, 196

Mirror-writing; *see also* Hand-and-eye preferences test for, 197

Monroe Silent Reading Test, 6, 18, 183

Motor aspects of reading, 107

Motor control, 99, 107

Motor methods, 112

Ordinal position among siblings, 100

Orton, Samuel T., viii, 83

Phonetic stories, 124-26

Profile of errors 38; *see also* Reading errors

- directions for scoring, 191-95
- examples of excessive errors:
  - in average reader, 57
  - in adult reading-defect case, 68
  - in brain-injury case, 71
  - in combinations of types, 67
  - in improvised reading, 76
  - in loss of reading ability, 72
  - in orientation and sequence, 64
  - under pressure for speed, 74
  - in sounds of words, 59
  - use of, in diagnosis of difficulty, 77

Proportional error scores, 38-40

Reading defects

- and arithmetic, 12, 13
- and auditory acuity, 95, 106
- and auditory discrimination, 93, 94, 106, 107
- and behavior problems, 102, 110
- and brain injury, 81
- causative factors, 79-110
- cause for referring cases, 103, 104
- and change of handedness, 89
- and chronological age, 8, 9
- and conceptual factors, 107
- and emotional factors, 105, 110
- frequency of, 15
- and health histories, 82
- and intelligence quotients, 35
- and language facility, 99, 108
- and left-eyedness, 83-91
- and left-handedness, 83-91
- measurement of, 6
- and mental age, 10, 11
- and methodological factors, 101, 109
- and mirror-reading, 88
- and mirror-writing, 88
- and motor control, 99, 109
- and ordinal position among siblings, 100
- and sex, 98, 99
- source of cases, 1
- and vocabulary, 99, 108

Reading errors; *see also* Profile of Errors

- classification of, 34
- addition of sounds, 35, 47, 129
- addition of words, 36, 51, 134
- consonant errors, 35, 45, 116
- omission of sounds, 36, 48, 131
- omission of words, 36, 52, 134
- refusals and words aided, 37, 53
- repetition, 36, 50, 133
- substitution, 36, 49, 132
- vowel errors, 34, 44, 116
- of controls, 57
- of reading-defect cases, 57
- reliability of, 41, 42
- standardization of, 43

Reading expectancy, 190

Reading index, 14, 15, 111

- calculation of, 190
- and intelligence quotients, 17
- reliability of, 17
- standard deviations and percentile ranks, 16
- use of, in selecting cases, 33

Reading "readiness," 80

Reading skills, 6

Refusals, 37, 53

Remedial instruction

- attitude of teacher, 115
- compared with ordinary teaching, 113
- control of behavior problems, 116
- criteria of success, 145, 146
- group instruction, 154-56
- individual instruction, 114
- modification of method to individual needs, 135
- motivation for, 115
- and personality, 159, 176, 177
- outline of methods, 116-35
  - for additions of sounds, 129
  - for additions of words, 134
  - for consonant errors, 116
  - for omissions of sounds, 131
  - for omissions of words, 134
  - for repetitions, 133
  - for reversals, 126
  - for substitutions, 132
  - for vowel errors, 116
- progress under, 139-54
- progress without, 144
- selection of, 111

Repetition, 36, 50, 133

Reversals, 35, 46, 86, 126

Schmitt, Clara, 116

Sex, 98, 99

Sound-blending test, 96, 97, 107, 199

Sound-dictation method, 123  
Sound-tracing method, 120, 127, 131  
Sounds  
    additions of, 35, 47, 129  
    discrimination of, 93, 94, 107, 117  
    omissions of, 36, 48, 131  
Speech defects, 91  
    articulatory defects, 91  
    stammering and stuttering, 92  
Spelling, 13  
Stanford Achievement Test: in arithmetic, 188; in reading, 7, 187  
Substitution, 36, 49, 132  
Success, recognition of, 115  
Terman, L. M., 5  
Thurstone, L. L., and Jenkins, R. L., 101  
Visual acuity, 80, 105  
    discrimination  
        of complex patterns, 81, 106  
        of orientation and sequence, 83, 106  
Visual-auditory learning test, 94, 198  
Vocabulary, 108  
Vowel errors, 34, 44, 116  
Word-blindness, 81  
Word-Discrimination Test, 7, 18, 34, 184  
Words  
    addition of, 36, 51, 134  
    aided, 37, 53  
    omission of, 36, 52, 134  
z-scores  
    for error-types, 44-54  
    formula for, 51







